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INDIAN FORESTER

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**MEMBERS.—MESSRS. F. B. MANSON, C. E. BRASIER, F. GLEADOW
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*Conservators of Forests.***

EDITED BY

E. P. STEBBING, F.L.S., F.Z.S., F.E.S.

**Vol. XXXI
1905.**



**ALLAHABAD
The Pioneer Press**

EUROPEAN AGENTS.—MESSRS. HUGH REES, LTD., 119 Pall Mall, London, S.W.

11/11/11
11/11/11
11/11/11

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APPENDIX SERIES.

A Note upon the 'Bee-hole' Borer of Teak in Burma, by
E. P. Stebbing.

Paper read by S. Chas. Philipps, M.S.C.I., on The Use of
Wood Pulp for Paper-making.

Erratum : December 1904.

STUDY OF SANDAL SEEDLINGS

Explanation of Plates, 4th line

For vegetation, mould and sand *read* vegetable mould and sand.



A Plantation of Eucalyptus Globulus at Ootacamund.



VOLUME XXXI

NUMBER 1

INDIAN FORESTER

JANUARY, 1905.

AN INDIAN BUREAU OF FORESTRY.

Cuilibet in sua arte perito credendum est.

1. GENERAL REMARKS.

IT has long been recognised by European Foresters that there is a large amount of special professional and scientific work to be carried out in connection with the proper care of the forests, and that this work cannot be performed by the officers engaged in ordinary executive duty; this latter if it is to be done efficiently necessarily requiring all the time and energy at their disposal. In order to ensure that this special professional and scientific work shall be effectively undertaken a special branch exists in the forest services of the various European States, and such a one has been recently created in America. To this branch the name of Bureau of Forestry is usually applied, and the several specialists appointed for the work are accredited to it. The officers of this Bureau concern themselves with the operations in connection with the supervision, etc., of working plans; with special investigations into (1) the reservation of any fresh areas required for climatic reasons and the preservation of the water supply; the requirements of districts as yet containing no forest reserves, or regulated district or village forests; with enquiries as to the best commercial trees to be found in the forests in different parts of the country, and as to the possibility of creating a demand for and putting on the market species for which there has been up to date no sale; with general forest botany, the distribution of the various species, etc.; the various diseases, insect and fungus, from which the forests suffer; and, lastly, with the very important investigations into the possibilities of the various minor products of the forests from a revenue point of view.

We will consider shortly these various forms of enquiry and research together with their bearing and importance on the management of, and on the revenue to be derived from, the forest estate.

(a).—The preparation and supervision of working plans.—

i. *Sylviculture.*—The Working Plans Branch would make the study of sylviculture a special part of their work. During their tours the officers would make careful observations and notes on this subject in collaboration with the local Divisional Officers. The elaboration and publication of such notes would be of the very greatest utility to the local officers, since the department would soon have some useful and adequate data on the sylvicultural requirements of our various species, a subject upon which at present, we think that most officers will agree, available data are almost as absent as they were in the time of our predecessors, the forest pioneers of thirty years ago.

ii. *Working Plans proper.*—The supervision of existing working plans, enquiries into necessary deviations from such, checking draft plans, the preparation of notes for new plans, etc., would form the main part of the work of the Working Plans staff.

(b).—Reports on afforested lands still not under reservation.—Such areas would be carefully inspected and the requirements of the surrounding inhabitants and the extent of their dependence on local forests not under the management of the department would be fully considered. It is well known that such forests are rapidly disappearing, and that if left without proper supervision they will soon cease to exist. There are still such in districts never visited by a Forest Officer, and which, consequently, never fall within his province to report upon.

(c).—A systematic record of all boundary work.—This would be carefully drawn up and kept on record in the Bureau, where it would be readily available for easy reference.

(d).—Measurements of rates of growth of the various species.—A large series of Sample Plots of all the most important species would be established all over the country. All records of the

measurements made annually (or more often if considered necessary) would be kept in the Bureau. Two important objects would be gained thereby. The first that the measurements would be continuous and would be unaffected by the unavoidably constant changes in the *personnel* of the staff of the various divisions in which the plots existed, and secondly (and more important still) the available data would be all collected in one spot, thus enabling statistics to be compiled and issued for general information as their value and usefulness became apparent.

(e).—*Advice and preparation of simple working plans for private owners.*—This would be undertaken by the officers of the Bureau in all cases where it was apparent that it was of advantage to the State that such lands should be kept under forest. This question is of the first importance in mountainous regions and in hilly areas where the safety of the agricultural lands depends upon the hills being kept under forests.

(f).—*Grazing and fire-protection.*—The innumerable questions arising in connection with these important subjects would also engage the attention of the Working Plans staff.

III. GENERAL INVESTIGATIONS.

These can be divided into several very important sub-divisions

THE MAPPING OF TRACTS TO SHOW THE DISTRIBUTION OF THE MORE IMPORTANT TREES IN THE COUNTRY.

(1) Studies of various classes or kinds of forests in India with a view to the preparation of accurate maps of each tract showing the distribution of such forests in the country and the areas they occupy. Pamphlets with a map in each would be drawn up for circles and divisions.

COMMERCIAL TREES.

(2) The systematic study of the more abundant trees in India with a view to the introduction, either to local or home markets, of species at present not used. In this connection the more ornamental woods of the country should be carefully studied. Experiments on a commercial basis, *i.e.*, such as would satisfy

commercial requirements, would be made with the woods with the object of placing them upon the market in such a manner as to ensure their meeting with success.

FOREST BOTANY.

(3) The distribution of the commercial trees would be accurately ascertained; the portions of the country where they grow best or are in greatest abundance be found out, and their area definitely laid down on a map. A short monograph on each tree would be drawn up as soon as all possible information about it had been collected. In this the areas in which its growth is at present the best should be given as also those in which, from the evidence of old stumps, it is made evident that in former days its growth was exceptionally good. A list of associated trees should be always given at the end of the monograph. Each tree would be dealt with by itself, and at the end of the pamphlet a small map would be attached showing the distribution (*a*) as pure forest, (*b*) mixed forest.

FOREST ENTOMOLOGY.

The great importance of the thorough study of the life-histories of injurious insects has been recognised, and a special officer has been already appointed to deal with this branch.

MINOR PRODUCTS.

It will not, we think, be contended that one tithe of the minor products of the Indian forests are known from an economic point of view. That there are great possibilities in this direction is the opinion of those who have considered this question. It has become apparent, however, that little progress is possible until the department are enabled to take up the matter themselves. A special officer attached to the proposed Bureau would be in a position eminently favourable for dealing with this large and important (from a revenue-making point of view) subject.

WOOD AND BARK.

(4) *Tannings*.—Especial attention is required to be paid to the investigation of tannings with a view to placing them upon the

market. A question of this nature requires the specialist, the man who could devote his whole time to this and cognate subjects. The chemist would analyse all important products.

Wood pulps also require much attention. The forests of the country contain large amounts of at present unutilizable timber of inferior quality. It has proved impossible for a Divisional Officer to dispose of them, and yet he is aware that they would in all probability do very well for wood pulp, and would supply the whole of the coarser paper required in the country.

TREE-TAPPING.

Rubber—Turpentine.—Whilst the actual growing and tapping of plantations as, *e.g.*, of rubber and of *P. longifolia*, etc., is the work of the Executive Officer, it would fall to the minor products specialist to find out about the best markets and the localities in which a certain produce is in most demand, etc. For instance, it is common knowledge that the difference in the prices of rubber is very great, varying with the species and the quality of the product obtained, both of which must depend to a great extent upon the nature of the soil, aspect, climate, elevation, etc. A specialist should be able to advise a local officer who was intending to put out rubber plantations on all these points. Again, competition amongst respective circles and divisions is undesirable. We believe that the industry in connection with the tapping of *P. longifolia* for turpentine was started in the School Circle and subsequently taken up in the Punjab, with the result that the latter Circle was able to cut out the former by underselling it. It would be the duty of the Bureau to see that this sort of thing did not occur, and that one part of a province did not expend money on undertaking a supply which could be done much more remuneratively in another.

OTHER MINOR PRODUCTS.

(5) *Myrabolans, grasses, canes, bamboos, gums.*—There can be little doubt that merchants at present suffer from not knowing what the forests contain and where articles can be obtained. Also, the commercial minor products of the country are by no means worked

up. We understand that in this connection Burma has now put on a special officer to deal with the subject. This is distinctly a step in the right direction.

A specialist of the Bureau would make this commercial aspect of the case his business. He would be acquainted with all the great firms, would know what things were in demand, whether others were likely to have a sale if placed on the market, would endeavour to create markets for new products by putting them on in such a condition that enterprising traders would soon come forward to take them up.

FORMATION OF PLANTATIONS.

(6) With the knowledge accumulated by the Botanical and Commercial Wood Specialist it would be possible for him to advise on the formation of valuable plantations in the country. A good commercial as well as sylvicultural knowledge of the value of the trees and whether a demand is likely to be maintained for their products is necessary before Government can be asked to make large outlays on plantations. An accurate knowledge of the means of communication in the country, the likelihood of feeder lines being built, mines opened (for which timber would be required), etc., etc., is necessary. Such knowledge, whilst being more or less of a sealed book to the local Divisional Officer, would be easily acquired by the specialist during his constant tours.

PUBLICATION OF RESULTS OBTAINED.

It is suggested that the best way of making immediately available to the department the results of the investigations of the Bureau would be to publish yearly Proceedings in which the information obtained by the various officers of the staff during the year would be collected together and issued. This would not preclude the same notes or information appearing again when sufficient data had been accumulated for the publication of a monograph on any particular forest tree or minor product. This is the procedure followed for some years by the Geological Survey, and which has now again, we understand, been revived under the present capable head of that department.

It may be said that this work would overlap with the Botanical Survey on the one hand and the Reporter on Economic Products on the other hand. We think not. We are of opinion that the Director of the Botanical Survey would be only too glad to have the sustained active co-operation of the department in this way. In the case of the Reporter on Economic Products, there can be little doubt that the Forest Officer with his special training and personal knowledge of the forests is perhaps the most efficient person to find out what are and what are not the most likely products to exploit, and the knowledge would be more quickly published and come at first hand if advertised by the Forest Specialist. In addition it would enable the heavily worked Reporter to devote all his energies to the agricultural staples of the country.

On the subject of acquiring the various specialists it may be pointed out that, since the department is officered by men who have received a sound scientific training, it may be taken for granted that from their numbers it will be possible to lay hands upon the requisite specialists.

THE STAFF.

A few words may be said on the subject of the staff required.

Working Plans.—We are of opinion that the Bureau, to be started upon good sound lines, would require two Working Plans officers. As already detailed, these men, whilst undertaking the work now performed by that over-worked individual the Assistant Inspector-General of Forests, would also tour round the country and make themselves practically acquainted with the method of working of each plan, would be in a position to decide upon questions of deviations from plans, would deal, under the Inspector-General, with the supervision of the preparation of new plans, would devote time to the study of silviculture, etc.

Forest Botany.—The specialist would be required in connection with the investigation of commercial trees with a view to placing them upon the market. He would also make a special study of, and advise local officers upon, the question of the formation of plantations, and would draw up the pamphlets on the various

classes of forests in the country. He would also be in charge of Forest Botany, with all the branches above described.

Forest Entomology.—This appointment already exists, and a distinct advance has been made in this important branch.

Minor products.—The work upon which this officer would be engaged has already been fully detailed. He would be required to have some knowledge of Chemistry.

One of the staff would be placed in charge of the editorial work in connection with the publication of the yearly "Proceedings."

The question as to whether it might be necessary to set aside for the Bureau small areas of forest in various parts of the country for experimental purposes is a matter which need not be entered into here.

This question of the formation of a Forest Bureau is one which we have often heard debated amongst Forest Officers, but we have never heard a reference made to the strong parallel which exists between the Geological Survey and the Forest Department in this matter. Both have their "crops" to deal with—the one mineral, the other vegetable. The Geological Officers have to search for and find their crop, which is hidden in the bowels of the earth or strewn in unrecognisable or unmarked forms on the surface. For such work a Bureau of Specialists is required, and exists. Having discovered the "crop" the rest is left to private enterprise, and thus a large executive staff is not required. In addition, however, to this purely economic and commercial part of their duties, the scientific work performed annually by the Survey is of immense value. If now we consider the case of the Forest Department we see that the crop either exists on the surface or has to be created; but since it is an ever-changing one, being subject to constant additions and removals, a large executive staff is necessary for its present management and to ensure its continuance for future generations. This work more than fully occupies the whole of the time and energy of the present staff. The study of the sylviculture of the trees, enquiries into their commercial value, investigations into minor products, and that purely scientific work which reflects a lustre alike on a department and upon its

Government, all these have had in the past to be neglected. It is to undertake the important researches of this nature that we venture to suggest that the Forest Department should be placed in a position similar to that of the Geological Survey and that an Indian Bureau of Forestry should be formed.

SCIENTIFIC PAPERS.

THE CASUARINA BARK-EATING CATERPILLAR.

(ARBELA TETRAONIS, MOORE.)

BY C. E. C. FISCHER.

Those who have been favoured with a copy of Mr. Stebbing's Note on Casuarina Insect Pests* will recollect that the first insect dealt with bears the name that heads these lines.

Mr. Stebbing summarized the information then known, suggested protective measures, and stated six points on which further information was desirable.

It was in the Government plantation (the Agusti Nowgam reserved forest) near here that Mr. Stebbing studied the insect during a brief visit in July 1903; and as I have since then had the insect in that plantation under as close an observation as circumstances permitted and have had the experience of one year's attempted protection, I have drawn up the following note in the hopes that the conclusions come to will be of service.

It will not be amiss to preface a short description of the plantation itself. The Agusti Nowgam plantation was started in 1893. Its primary object was the protection of the fields of the village of the same name from the encroachment of drifting sand. The village to be protected is on the shore of the Bay of Bengal on the southern bank of the Rushikulya river, the chief water-

*"A Note on the Casuarina Insect Pests of Madras," by E. P. Stebbing, F.L.S., F.E.S., Officiating Superintendent, Indian Museum, Calcutta: Office of the Superintendent of Government Printing, India, 1903.

course of the Ganjam district. Violent south-east winds carry the sand along to an almost incredible extent. It is only by great and constant labour that the public buildings and offices of the adjacent small port of Gopapur are kept free of the all-per-vading sand. When any obstruction to the free drift of sand is met the latter is piled up in dunes 50 feet and more in height and the windward rows of Casuarinas are completely buried. In its protective mission the plantation has been entirely successful. The area of the reserve is 792 acres, but so far only 320 acres have been actually planted up. The area planted is V shaped, the threatened fields are in the angle, and the apex is presented to the south-east wind. The plantation has met with very varying success; in most places the result is highly satisfactory, but here and there patches have quite failed to produce useful trees. Not a little of the failure is due to water-logging in low-lying places but by far the most important factor will probably prove to be a noxious fungoid disease, which is now under investigation. The maximum growth for ten years produced poles 75 high with a breast-height girth of 40'.

The plantation is about $3\frac{1}{2}$ miles from Chatrapur, the chief market supplied. Owing to the sandy nature of the ground to be traversed, transport charges are rather heavy. Fortunately the presence of a considerable lake facilitates transport over some two miles of the distance. The quantity of wood annually exploitable is too small to warrant the laying of a trolley line, and the small demand, shared by two or three private plantations, precludes the planting up of a larger area for the present. A regular working plan was framed and sanctioned in 1903, but, as will be seen, had to be deviated from at the start. The plan provides for clear felling and uprooting over 32 acres every year (9 acres are reserved as a break wind belt on the outside edge of the two legs of the V, leaving 320 acres to be felled over in ten years). The area felled is to be replanted during the ensuing rains. Originally the seedlings were put out 6' x 6', but the plan provides for replanting 9' x 9', which is cheaper and gives better results.

To return to the insect pest. Its appearance in the plantation was first observed and pointed out to me by the Conservator of the Circle in December 1902. This was my first acquaintance with it, but the Conservator had seen it and its depredations elsewhere, and warned me accordingly.

The progress of the attack was closely watched, and specimens of the larva were sent to Mr. Stebbing. The attack on this occasion was not a severe one, and the insect appears to have first made an entry into the plantation in the month of September. The imago issued the following June and July; the new generation was then watched for, and was first observed early in September. It soon became very obvious that this fresh attack was far more intense than that of the previous year and had spread centrifugally from the site of the original attack.

Immediately curative measures were started, as suggested by Mr. Stebbing, and boys were sent round to collect and kill the larva under the charge of a watcher.

Almost from the beginning the impossibility of destroying all the larvæ became evident, as the flexibility of the topmost branches, upon which their presence was visible, prevented their being climbed. The destruction was, however, persisted in for a time in the hopes of making a considerable impression on the invading hordes. Meanwhile the two watchers were marking with whitewash all trees on which the destructive covered ways of the larva could be seen.

When early in October, after the destruction of over 63,000 larvæ no appreciable diminution in numbers had been effected the urgency for more drastic measures became apparent. Sanction was obtained to depart from the provisions of the working plan by abandoning the felling of the year's coupe and cutting out all infected trees wherever found throughout the plantation. In addition the neighbourhood of the lake referred to above was taken advantage of, the felled poles being transported thither as soon as possible and immersed for several days. Unfortunately, owing to the heavy sand and the scarcity of labour just then, transport could not keep pace with felling, and the poles had to

be left lying in the plantation for some time. It is therefore possible that some of the larvæ migrated from felled to unfelled trees. There is, however, no evidence in support of this presumption, and as the larvæ are very reluctant to leave their retreats and covered ways this change of abode must not be accepted as certain. In all about 25,000 trees were felled. The result of this operation was awaited with some impatience. High hopes were entertained that the pest would be eradicated—hopes unfulfilled however.

At the end of August of this year (1904) the first covered ways of the new generation were observed. At first this was put down to a few trees attacked last year being overlooked, but this was soon seen not to account for the entire fresh outbreak.

Just outside the plantation, the villagers have themselves planted up about an acre with *Casuarina*. This patch was attacked by the *Arbela* last year, and being somewhat concealed behind a hitherto uninfested portion of the reserve, was most unfortunately overlooked. The new attack is not of a very severe nature and is more restricted in its spread, so that the measures adopted last year were at least partially successful. It is hoped that a further operation including in its scope the small private patch will rid the plantation of the pest for some time at least.

The following observations on the insect and its habits, as they bear directly on protective methods, will, I hope, prove useful.

As Mr. Stebbing, in the Note already quoted, has described the *Arbela* in all its stages (excepting the ♂ imago not then seen by him), it will only be necessary to mention that the ♂ insect is similar to the ♀ but about half the size.

Life-history.—The moth issues during June. In 1903 a ♀ from a captive pupa issued on 3rd July, and in the current year a full grown larva was found on a *Casuarina* tree as late as the 23rd July. As a female bred out in captivity laid eggs within 24 hours of issuing from the pupal case, it would seem that the eggs are laid in June or July at latest. I have, however, no direct evidence on this point, nor as to where the eggs are laid, as I have not been

able to find them. I am, however, of opinion that they are laid directly on the boles of the trees, generally near the point of insertion of a branch or twig. This I conclude from finding very young larvæ, which must have been recently hatched out, fairly high on the trunks, already hidden in *separate* covered ways.

The earliest date on which the larvæ were observed was 26th August. They feed on the bark, restricting themselves to the superficial layers when very young and gradually working in deeper as they grow. From the very first the larva constructs a covered way made up of particles of its own excrement and bark joined with silk. The diameter of this covered way increases of course with the growth of the caterpillar and extends in length. It may wander in any direction, up or down or horizontally, and may maintain a straight or a tortuous course.

At an early stage the larva constructs at one extremity of the covered way a small chamber under the bark, preferring to locate it in the upper angle formed by the junction of a twig with the bole. Here the grub rests when not feeding. It emerges to feed on the bark immediately surrounding the extremity of the "run," which is built up further as the bark is eaten around it. It apparently feeds at night, as I have never found it by day outside the covered way, nor indeed anywhere but in the chamber described.

The larva attains its full size by March or April, and then prepares the pupal chamber. Up to this stage it has penetrated the bark alone except where an existing hole has been utilised as a resting chamber. If such a suitable hole has been found, this is probably merely trimmed, otherwise the larva, being possessed of powerful mandibles, bores into the wood and excavates a pupal chamber about an inch in depth, and this it enters for the final stage in May and June, pupating with its head towards the orifice, which is concealed by the extremity of the covered way.

It being almost impossible to keep the larvæ alive in captivity, the exact duration of the pupal period cannot be easily observed. The only guide I have to go upon is that among several pupæ

brought to me on the 4th June was one which had not yet undergone the full transformation from the larval stage, and had therefore only just entered upon the pupal one. It remained alive till the 25th June, when it died, having then the appearance assumed by the chrysalis immediately before the imago issues. Hence it may be deduced that the pupal stage occupies from three to four weeks.

By the time the larva has reached its full size it is feeding so deep as to reach the wood, which is here and there exposed. In the current year pupæ, obtained by splitting open felled poles, were brought to me from the 3rd to 5th June, and the moths began issuing from the 7th of the same month. Several died and dried up. This was probably due to their being much shaken, as I had several changes of camp between the 7th and the 25th. Nevertheless some half a dozen moths of each sex were obtained. Two of the males I obtained from *Acacia leucophlea* trees. By touching the anterior extremity of the pupæ, which was near the surface, they were irritated into wriggling, and this brought them mechanically to the outside. In both cases the imago issued the next day.

It would have been interesting to know exactly how the pest found its way into the plantation as well as into the larger private plantation at Gopalpur (belonging to Mr. F. J. V. Minchin of Aska,) 10 miles distant; in both plantations it seems to have first appeared in 1902. Two other private plantations lying between the two referred to above have so far escaped attack.

The larva feeds on the bark of many grove and avenue trees in the vicinity of the attacked plantations, and doubtless spread from these. So far I have found it attacking the following: *Acacia leucophlea*, *Acacia arabica*, *Holarrhena antidysenterica*, *Anogeissus latifolia*, *Millettia auriculata*, *Eucalyptus globulus* (one). The first in the list is probably its favourite food, as along some of the roads where the species is planted every tree is the host of several of these insects.

As the caterpillars feed on species which contain such apparently obnoxious saps as those of *Eucalyptus* and *Holarrhena*,

it is reasonable to expect them to thrive on any other woody species. This question of discrimination as to food plant has considerable importance, as will be seen when protective measures come to be discussed.

Such pictures of the devastating action of this insect were presented to me, it being claimed that whole plantations had been destroyed, that I must confess to very serious alarm when I saw the extent of the attack in the plantation in September 1903. While still holding that a very severe attack is a very great threat to the life of many of the trees, if not of the whole plantation, I do not now think that a comparatively mild one would do much actual damage. I am led to this opinion by the fact that in another small Government plantation though every tree (15 or 16 years old) carried three or four larvæ during the past year, not one seems the worse.

As Casuarina wood is used, here at least, almost exclusively as fuel and never in scantlings, the small bore holes do not depreciate the value.

If, however, a severe attack is experienced so that each tree is the host of a number of larvæ (I found 28 on one small tree between 2 and 10 feet up), it is certain that the damage occasioned will be great, as such trees are liable to be ringed and killed. Even a slight attack, however, will kill young saplings up to a couple of inches in diameter, as was pointed out to me in the private plantation at Gopalpur, already referred to.

An incipient attack should therefore on no account be neglected, but where a plantation is in close proximity to wooded lands or avenues, once *Arbela tetraonis* appears in the tract, it will probably be impossible to keep it out of the plantation altogether. In these parts Casuarina is usually planted along the coast on pure sand in isolated plantations, and this affords protection from invasion to a certain extent, but, as unfortunately demonstrated in the instance under consideration, by no means absolutely.

The above record of observations shows that protection is by no means an easy matter; that probably no thoroughly efficient

action is possible, and further that curative measures must be drastic.*

It is proposed to plant a certain proportion of other species in admixture with the *Casuarina* (approximately 25 per cent), and this proposal is already being adopted in several Government plantations in the Madras Presidency. In the current year in the local plantation 5 acres outside the regular planting for the year have been planted up with 60 to 70 per cent of *Casuarinas* and 30 to 40 per cent of *Tamarind*, *Dalbergia sissoo*, *Thespesia*, *Populnea* *Nim* and *Sapindus trifoliatus*.

It is obvious that great circumspection must be exercised in selecting the species so as not to include such as are known to be attacked by the *Arbela* larva. At any rate, the admixture cannot fail to have a beneficial action in regard to the fungoid disease referred to previously.

It has also been suggested that the introduction of broad-leaved trees in the plantation will attract insectivorous birds. This result may well follow, but in view of the caterpillar's retiring habit I do not think that any birds except woodpeckers could reach it, and it is doubtful that these birds would live so near the sea.

A number of the moths might, it is true, be eaten by birds in their very short season; but here, too, I suspect protection by nocturnal flight, though I venture this statement with reserve. However, the moths bred out in captivity appeared more lively by artificial than by day light, and the only moth (♂) seen in a free state came into a rest-house at night, attracted by the lamp-light no doubt, and I found it at rest on the mosquito net in the early morning.

* I agree with Mr. Fischer that in the case of severe attacks such as he had to deal with in 1903 this should be so. It should be borne in mind however that such exceptional increases in the numbers of this pest are probably by no means of frequent occurrence. As an instance of how rarely the moth has been taken by collectors I may mention that there were but three specimens in the British Museum Collections in June last, one in the Indian Museum, taken in Calcutta by De Niceville some ten years ago, and one specimen from Ganjam in my collections. In smaller attacks and to keep the insect within bounds year by year I think the method of handpicking by boys should be resorted to.—E. P. S.

As regards other enemies, I regret that I have nothing to record. The larvæ and pupæ kept under observation were quite free from the parasitism by other insects so frequent with other species of lepidoptera. Those larvæ which died in captivity appeared to have succumbed to uncongenial surroundings, dry wood and bark to live in and feed on, in place of green, and the pupæ died off from no apparent cause. I have found no predaceous insects in or near the covered ways, though I have examined a large number; and where small black ants were found haunting a hole occupied by a pupa, the latter appeared in no way inconvenienced. In short, the sole enemy of *Arbela tetraonis* at present known would seem to be man. As a curative measure, therefore, I do not see any practicable alternative to cutting out all infested trees, and I should be grateful for any suggestion on this point.

The compilation of a list of species which have been seen to be attacked by the pest would be most useful; and it is hoped that others will record their observations.

I think that now Mr. Stebbing's questions, except where they enquire regarding variation according to locality, can be answered as follows:—

1. The eggs are laid on the boles and larger branches at a height of from two to three feet to the topmost woody portions. They are probably laid singly or in groups of a few only. If laid in patches, then only a few hatch out. The number laid by one moth is not yet known; but a captive moth laid about 100 unfertilised eggs in one clump (she was in a small box and could not disseminate the eggs).
2. The larvæ hatch out at the end of August and during September.
3. The young larvæ do not live gregariously; from the first each makes its own covered way.
4. The larval stage lasts from September to May.
5. The pupal stage probably lasts from three to four weeks.
6. The moths appear in June.

Other Forest Officers will probably be able to throw further light on the habits of this pest which, until quite recently, were totally unknown.

P. S.—Since penning the above I have received an interesting note written by Mr. W. A. Stracey, Range Officer, Delta Range, Godavari District, and I cannot do better than quote it in his own words :—

“ On my visit to the Kandikuppa plantation on 15th November 1903, I noticed several young trees completely girdled, and many of them were broken down by wind. The trees were also bored near the part girdled. The trees were completely girdled at various heights two to four feet from the ground. The bark and cambium were completely eaten through for a width of two to four inches. The borings in the trees were invariably in the upper part, although one case was noticed where the insect had bored into the stump. The trees above the part girdled were either dead or dying. I had several of them split up and removed. The worms I sent to Mr. Stebbing, who identified them as larvæ of “*Arbela tetraonis*.” Some of the larvæ were evidently approaching the pupal stage. While I was in the plantation I had every tree found girdled cut down, split up and the larva killed. Fortunately the attack was not on a large scale.

“ About a dozen plants each were so treated in two coupes, and the supervisor was instructed to do the same whenever he met with a plant attacked. The plants attacked were either those of the second or third year's growth. Very few attacks were noticed in the one year old coupe. In the Bendemoorlanka plantation also the attack was confined to young trees (two to four years old). Attacks on larger trees were not noticed. No attacks have been reported as yet this year.”

It is clear that the plantation was saved from disaster by the prompt action taken by Mr. Stracey, the unwelcome guest being fortunately observed when the attack was very slight.

Mr. A. W. Lushington, Conservator, N. C., has endorsed on the above note.

“ In or about 1894 the Kara Reserve in Kistna was annihilated by the borer.”

ORIGINAL ARTICLES.

A FEW REMARKS CONCERNING THE FORESTS OF THE
JARRAH, *EUCALYPTUS MARGINATA*, AND OTHER
SPECIES OF *EUCALYPTUS*.

BY HERR DR. L. DEILS, BOTANICAL MUSEUM, BERLIN.

I have had the good fortune to spend fourteen months in the forests of Western Australia, from November 1900 to the end of December 1901, after which I travelled about a month in Tasmania to see the forests of *Eucalyptus globulus*. As some of the Australian *Eucalyptus* are cultivated in India, I have the hope that a few remarks regarding the constitution of these forests may be acceptable to the readers of the *Indian Forester*.

Eucalyptus marginata, the "Jarrah," is only to be found in the south-west corner of the State of Western Australia. This part of the Australian continent is remarkable for having regular rains during the winter, *i.e.*, from April to October, the average annual amount being from 30 to 40 inches. The climatic conditions of this region, then, are very different from those prevailing throughout the arid interior of the Australian continent.

The area covered by *Eucalyptus marginata* in Western Australia is stated to be 8,000,000 acres. In fact, nearly the whole country between the mouth of the Moore River in the north and King George's Sound on the south coast may be described as one vast forest of *Eucalyptus marginata*. Next to the world-famed gold mines of the interior, these forests constitute the principal wealth of Western Australia.

The industry built upon it is steadily increasing. The beautiful red timber, so highly prized for paving blocks, is a conspicuous feature of Western Australian scenery. It meets your eye everywhere; all houses are built of it; planks and scantlings in huge piles are to be seen at the Railway stations and on the jetties for

export. It is never attacked by insects, and it is suited for all kinds of out-door work. Hence it is the staple timber of Western Australia.

In the lowlands between the coast and the inland plateaux, which are on the average about 20 miles wide, jarrah does not form compact forests, but grows scattered on the sandy plains, overtopping an undergrowth of two stories: a few small trees or tall shrubs—chiefly Proteaceæ—forming the upper story and an endless variety of low bushes with rigid branches and hard evergreen leaves the lower one. In these localities the jarrah has somewhat the shape of isolated oak trees in English parks, with spreading branches and broad crowns. Thus we see it near the lower Swan River; it gives the scenery round the city of Perth and suburbs its peculiar character. In this part of the country the trees are allowed to grow and are not utilized on a large scale.

The commercially important forests commence on the hills which form the western slope of the huge tableland of Australia. Here the appearance of the forest is gradually changing. The number of trees per acre increases rapidly; the elbow-room being less, the trees are growing taller, and, at the same time, the crown decreases in volume. The result is a dense and generally pure forest of this species.

Needless to say, this is brought about by a change of the external conditions. Here we find what is well known in all parts of the globe: the moist currents which come from the sea are compelled, when ascending the ghats, to give off part of their moisture. The rainfall is increasing. The soil, not being sandy, consists mainly of the gravelly détritue of the underlying granite, usually called "ironstone-formation."

Under such conditions the jarrah is seen at its best. The trees, attaining 90—120 ft. in height, are fairly well provided with foliage. Apart from an addition of *Eucalyptus calophylla* in places, there is no other arborescent species in these forests, the chief undergrowth being the younger generations of the jarrah itself.

This extraordinary uniformity of the chief constituents of the forest is in striking contrast with the endless variety of small bushes, about $1\frac{1}{2}$ —3 ft. high, which cover the whole ground with their evergreen foliage, and adorn it, during the rainy season, with the rare splendour of their flowers.

This feature makes the jarrah forest very different from the type of *Eucalyptus* forests common on the tableland of the Eastern States of Australia. In these regions the forests are more open. The ground is covered mainly with grasses and annuals, which make their appearance in the rainy season. The green carpet beneath the lofty trees gives a very pleasant aspect to these forests during the wet months, but it vanishes rapidly as soon as the hot weather approaches.

Even more different is the aspect of the jarrah forest from the woody vegetation of the central portions of Southern Australia. For in these desert regions the scrub mainly consists of various low-growing, almost shrubby, species of *Eucalyptus* and *Acaria*, growing intermixed.

It is not very difficult to recognize *Eucalyptus marginata* in the genus. The trunk is covered by greyish brown bark. The leaves show the common shape of *Eucalyptus*, drooping in the adult state of the tree, but being erect on the young plant. Otherwise there are no pronounced differences between the young foliage and the old.

The conditions which regulate the production of flowers and seeds have not yet been sufficiently studied. I have seen flowers on medium sized shrubs of jarrah of apparently quite a young age. In other localities tall trees only produced flowers. I have found flowers in November, June, and occasionally in other months of the year, but never very plentiful. I was told, however, that from time to time, as is the case with the beech and other forest trees, a heavy seed-year occurs, when the whole forest is said to be one mass of white flowers.

As mentioned above, *Eucalyptus calophylla* is the only species to be met with as a companion of *Eucalyptus marginata*. Never constituting a forest by itself, it is intermixed freely with *Eucalyptus*

marginata or a few other species of more social habits. When growing isolated, *Eucalyptus calophylla* has a most beautiful appearance, strikingly similar to the oak in Richmond Park.

As indicated by its name, the foliage is the principal adornment of this fine species: it is very dense and of a rich green colour. The shape of the leaf, as well as its nervation, are of a type not common in the *Eucalyptus* genus. Still more extraordinary, however, is the position of the leaves towards the light. While most of the other *Eucalyptus* have their leaves drooping or erect, that is, vertical, the leaf of *Eucalyptus calophylla* is horizontal, following the habit of the vast majority of trees. It follows that *Eucalyptus calophylla* is a much more shady tree than most of the other species.

The shape of the large flowers and fruits also is nearly unique in the genus. It is certainly one of the most distinct species of *Eucalyptus* indigenous to Western Australia.

Economically, *Eucalyptus calophylla* ranks far below *E. marginata*. Still it is very ornamental; the gum-resin is valuable on account of its medicinal properties, and the bark is used for tanning. The timber is much inferior in quality to that of other species.

Another important species of Western Australia is *Eucalyptus diversicolor*, the "karri." It is perhaps the finest tree of the country. The trunk is very straight. The smooth bark peels somewhat like that of the plane; it is always white and clean. The height of the tree is unsurpassed in Western Australia, and equalled only by *Eucalyptus amygdaline* of the south-east corner of Victoria. Specimens about 200 ft. high and 40 ft. in diameter at 3—4 ft. from the ground and about 120—150 ft. to the first branch are by no means uncommon; much larger trees, up to 300 ft. high, have been actually measured.

Eucalyptus diversicolor has a very limited geographical area on the south coast of Western Australia, from Cape Leeuwin to King George's Sound. This is the wettest part of Western Australia, where the dry period of the year is less pronounced and the heat of the summer considerably reduced. A narrow strip of land along the coast is covered by forests of this gigantic tree

The finest growth is to be seen on rich "ironstone" soil. The forests of karri are just as pure as those of jarrah, while the undergrowth is of a similar description.

In conclusion, I may be allowed to add a few remarks regarding the natural conditions of the forests of *Eucalyptus globulus*. This species, the Eucalyptus best known outside Australia, enjoys conditions of life more favourable than most of its congeners. It is indigenous to Tasmania. The more or less periodical rains of continental Australia are here, on this mountainous island, replaced by a fair rainfall all the year round. Hence the appearance of the woods of *globulus* is different from most continental types of Eucalyptus forest.

In Tasmania the enormous columns of the dominant tree reach a height of above 200 ft., the drooping foliage spreading a light veil above the umbrageous trees of the undergrowth. This lower story is much more conspicuous than anything in the continental forests. First, there are the saplings of *globulus* itself, with their strange glaucous foliage, so utterly different from the narrow alternate petiolated leaves of later life. Then there are a number of pretty trees with soft foliage, many of which are remarkable for their affinity to species of the Indian Archipelago. Among these are often fine specimens of fern-trees, species of *Dicksonia* and *Cyathea*, their black stems completely covered by filmy ferns, mosses and liverworts. The ground is hidden by fallen logs and branches, with thick layers of moss upon them; by huge tufts of ferns growing between, and by tall herbs rooting in the deep black soil. Altogether, the primeval forest of *Eucalyptus globulus*, with its harmonious combination of every possible shade of green, makes one of the grandest pictures of vegetable life, quite unlike any tropical scenery, and at the same time entirely different from anything which makes the forest of the more temperate zones so delightful.

Our illustration shows the growth of *Eucalyptus globulus* at Ootacamund which, we think, will prove of interest to Dr. Deils and our readers. It is reproduced from a photograph very kindly taken by Mr. H. Jackson, I.F.S.—Hon. Ed.

RIVER PROTECTIVE WORKS AT DEHRA GHAZI KHAN.

BY G. M. RYAN, F.L.S., I.F.S.

"It has been decided by the Government of India that no more money shall be spent on protective works at Dehra Ghazi Khan." Such is the announcement which appears in the issue of a contemporary of the 28th July last, and it is reproduced in order to draw attention to the general policy of the P. W. Department in dealing with the protective works on the Indus, a policy which, it is urged, is not based on sound economic lines.

Large sums of money were spent in endeavouring to save Dehra from destruction by flood and erosion, and the expenditure of further large sums was contemplated. A Sind Engineer's services were, however, brought into requisition, and he advocated a relatively inexpensive scheme of protection. This was tried, but failed. Now it has been apparently decided that all further attempts to protect that military station from destruction shall be abandoned, and if such is the case, the question arises, could not this have been foreseen at the outset?

Although I have not visited Dehra Ghazi Khan, some years ago I made a study of the history of the Indus, and was able to form certain conclusions about the laws governing its vagaries; and these subsequent results seem to have confirmed. I think it is possible to lay down a few broad principles for guidance in regard to the erection of protective works along both banks of the stream, which might be followed.

In an article published in the *Indian Forester* in 1896 (Vol. XXII, page 119), entitled "The River and the Best Method of Embanking it," I attempted to show how the various belts of vegetation along the Indus in Sind came into existence and were arranged as it were in a *natural order* along both its banks, and how futile it was to erect embankments as protective works counter to their gradual development.

The risks run by persisting in the present bund policy were also pointed out; that no properly thought out working plan existed for protective works on the river; that one Engineer put into operation a scheme in his Division, the full details of which

were unknown perhaps to the officer of the adjacent Divisions ; and that works in one locality naturally had a prejudicial effect on the protective works in another.

Although the observations and conclusions in the article alluded to refer almost exclusively to Sind, and although Sind and the Punjab are two different Provinces, the geological character of the flat alluvial plain through which the Indus runs in both is so similar that the arguments which have been used in support of the contention in the one case could be made applicable in the other.

That the conditions are somewhat analogous is borne out by the fact that a Sind Engineer was ultimately brought in to try and grapple with the problems at Dehra Ghazi Khan.

I need scarcely say that my criticisms are made in no hostile spirit to the great P. W. Department. My contention is that the bund policy in Sind tends to raise the level of the sectional area of the river within the bunds, and that when this area has been gradually elevated, the stream proceeds to swerve to a lower level, which is, of course, outside the area of the bund, and that no amount of works of protection will prevent erosion of the banks when the river has thus made a *set* on to them. This is what, it is to be supposed, happened at Dehra Ghazi Khan, and if the P. W. Department had properly grasped the situation the futile attempts to stem the onward march of the river would never have been made.

The elevation of the sectional area of the river between the bunds is a factor in the question which the P. W. Department do not accept. So far back as in 1896, when the matter was broached to an experienced Engineer in Sind, he replied " that the embankments raise the river level is certainly open to doubt except in areas subject to tidal influence." If doubts existed eight years ago, have any data been obtained since to disprove the theory? According to Sir Evan James, Commissioner in Sind (see remarks later on), Government in 1896 were going to appoint a special officer, whose sole charge was to be the Indus, to watch its vagaries and ascertain if there were any laws under which it acts. If this officer was appointed, as presumably he was, he might be able now to throw some light on the subject, and it would be interesting to

hear whether my observations and conclusions are confirmed or not.

The embankments which were laid down everywhere in Sind up to the time, at any rate, when I left that Province, viz. 1897, were aligned without a thought apparently beyond present necessity. This is surely not the correct policy.

This plan of closely hemming in the lateral overflows of the Indus by high earthen embankments is one that affects forest officers in Sind especially, for the building of these walls close to the cold-weather course of the river in that Province causes the forests situated outside that wall to be shut off in the flood season from the water-supply to which they are legitimately entitled, and loss of irrigation facilities for the forests means, of course, their practical extinction. My letter already alluded to was written with the object of drawing attention to this matter. I see from the Sind Annual Administration Report for 1901-02 that this question was still under discussion. The Conservator in alluding to natural regeneration, para. 44, wrote—"In perhaps half the forest area, having only its natural difficulties to contend with, a satisfactory and, in some cases, excellent natural regeneration is present. In the other half of the forest area there is little or no regeneration either because the land is above flood level or because some bund or *canal bank* has made a desert of it. I am making a special representation to Government on this point." And again (para. 95)—"The progressive deterioration of the forests due to constantly increasing bunds and canal banks has naturally produced a state of moral weakness and want of confidence which results in babul lands being sown with inferior but hardly khandi rather than risk disasters like that of Miani or the simple failures that have been so frequent."

The Commissioner, Mr. Cumine, in reviewing Mr. Gleadow's report wrote—"The question whether, now that the flood waters have been so much cut off by 'bunds' from the forests that lie back from the river, there ought not to be a definite irrigation scheme worked out for each such forest will engage the attention of the Commissioner during the present touring season."

If the bund policy of the P. W. Department as regards the erection of embankments is to be persisted in the only alternative would appear to be Mr. Cumine's very reasonable suggestion.

Since writing the above, telegraphic news has reached the Bombay papers that the Kushmore Bund, which is at the extreme north of the Province of Sind, and which is an important work intended for the protection of the Jacobabad and Shikarpur districts, has been breached. The breaching of this bund is a very serious matter indeed. During the inundation season the Executive Engineer of the district is under the necessity of residing close to it, or practically on it, and a small army of men are entertained to patrol it night and day, in order that any damage may be promptly reported and repaired. That a serious breach under the circumstances should have taken place indicates either neglect on the part of the local staff to do their duty satisfactorily or that the damage was out of their power to prevent; and it is thought the latter is probably the correct explanation of the case.

Admitting the latter explanation, the increased apparent height of the floods in the vicinity of Kashmir, compared to those of previous years, seems the obvious explanation, and this is yet another argument in corroboration of the theory regarding one of the direct effects of the protective works on the Indus.

The P. W. Department are apparently quite satisfied because by their policy Government are realising by the embankment system in Sind a profit of 11% on the capital outlay (*vide* para. 12 of the Sind Administration Report for 1893-94 quoted in part in the *Indian Forester*, pages 57 and 58, Vol. XXII), but this figure does not indicate the real state of things. It is based merely on the profits realised from assessment on agricultural land, and the enormous losses by erosion of valuable forests, which it has taken a century or more to rear, and which were (in 1894) comparatively the most valuable per acre in India (*vide* para. 119 of the Sind Administration Report for 1893-94), are not taken into consideration; neither are the losses resulting from shutting off the water-supply from extensive

tracts, forests or otherwise, which are thereby rendered sterile, being covered with salty efflorescence.

In 1894 the question of placing the bunds much further back from the cold-weather course of the river was raised by myself, and the Commissioner in Sind, Sir Evan James, who was sent a copy of my notes on the subject, wrote very courteously as follows :—

“The bund policy that has been followed in Sind of late years was called in question by Mr. Joyner and thoroughly gone into and decided upon by Government not long ago. I think, therefore, it is unnecessary to raise the question again. Government are going to appoint a special officer, whose sole charge will be the river Indus, to watch its vagaries and ascertain the laws under which it acts. As a matter of fact, in the matter of bunds as in everything else, we have to cut our coat according to our cloth. Bunds are enormously extensive, and the further away from the river the more they cost, as the river runs along a ridge,* and bunds in lowlying ground are extremely expensive to build and maintain. Of the merits of the policy pursued, the revenue returns are the best proofs. The more care taken in repairing and extending bunds, where found necessary, the greater and steadier has been the increase of revenue, *i.e.*, of cultivation. The uncertainty attending all cultivation and the loss and misery that results therefrom would be so enormous that any attempt to dispense with bunds would be quite out of the question.† Admitting, then, that bunds are necessary, the question of where to place them depends mainly on the set of the river, the height of the land, and the money available. No doubt to you as a Forest Officer it would be pleasant to have a large forest-clad area on both sides of the Indus, but it would not be pleasant to the owners of the present lands to see their property practically destroyed.”

I also submitted my notes together with Sir Evan James' reply to Mr. Young, one of the ablest Engineers of the Province,

* In my paper on the best method of embanking the Indus this is all shown in diagrams.

† The abandonment of bunds, as will be seen from my paper, is not advocated.





Photo.

The Growth of Spike in Sandal.

S. B. Mondul, del.

at the time, and although I am precluded from quoting all what Mr. Young said, because he has since retired and I have not his permission to quote his remarks, which are marked private, he stated that the Commissioner had given a very fair, concise and correct reply to my plea.

This being the opinion of the P. W. Department, it can only be repeated that their policy of trying to hem in closely the lateral overflows of the Indus does not appear to be invariably based on sound economic lines, and with the Dehra Ghazi Khan example before us, it would seem that the bund policy is scarcely one to be blindly followed. If my remarks meet the eye of any P. W. Department Engineer, it would be interesting if he would give us his side of the case in the pages of the magazine, taking this article in conjunction with my previous one.

The absence of vegetation along both its banks and the character and disposition of such vegetation, if existing in almost gregarious belts, form a valuable index as to the best and most economical alignment to be followed in the long run for its embankment system, and until the P. W. Department realise this, it is believed that success in grappling with the Indus River problems can never be satisfactorily achieved.

CORRESPONDENCE.

GROWTH OF SPIKE IN SANDAL.

The extremely interesting and excellent photograph on the "Growth of Spike in Sandal," which was most kindly taken by Mrs. Andrew, was sent to us with the following note by Mr. P. M. Lushington :—

Enclosed is rather an interesting photograph of "Spike" taken by Mrs. Andrew.

The left-hand flower-pot contains a branch of a healthy plant, the second contains a branch just attacked. The leaves have begun to "bunch" and grow smaller. The third has two branches. On

the left one taken from a tree badly attacked, the other with hardly a leaf left, *i.e.*, in the final stage just before death.

I don't know if you can print in the *Indian Forester* from an ordinary photograph ; if so, this may be useful to you ; if not, will you kindly return it.

P. M. LUSHINGTON.

Coimbatore.

WORKING PLANS.

In the September and October numbers of the *Indian Forester* are two articles by "More Light" under the title of "Proportionate Fellings in Sal Forests."

The remarks in the first article apply so generally to all working plans that it may not be out of place to refer to the subject again and especially to invite the attention of the Honorary Editor to the suggestions given below:—

2. Defective as many of our working plans may have been, it is rather severe to lay the blame on them if the forests concerned are only a few degrees less abnormal at the ends of the periods covered.

To begin with, our use of the term "working plan" is rather loose. It may mean a plan extending throughout the whole life-history of a tree (*i.e.*, tree rotation), or else it may include only a single felling rotation, of anything from 10 to 40 years. In India the term generally has the latter meaning, so that in the course of one "tree rotation" there may be a whole series of working plans.

It would have conduced to greater precision in the use of these technical terms if such successive plans had been called "periodic plans" or "subsidiary plans," or even "plans of operations," and to have kept the term "working plan" exclusively for the main scheme—underlying all the periodic plans in succession—for first bringing a forest to normal conditions and then for keeping it so.

Until a forest is normal there can, ordinarily, be only one working plan, but there may be any number of periodic plans, owing to the difficulty of going much into detail very far beforehand.

In all our working plans, at or near the beginning of Part II, there are three prescribed sections—

- (a) Object sought to be obtained.
- (b) Method of treatment.
- (c) Exploitable age or size.

These three sections constitute the working plan proper, and must run through all the series of periodic plans until the forest is normal, with only such modification of elaboration as experience or necessity may call for.

Any alteration of silvicultural importance in the "Objects of management" must mean a far more decided break in the life-history of a forest than the winding up of one merely periodic plan and the starting of another.

The "Method of treatment" should be included in the plan proper, because the changes in it ought not to be other than few and far between. The second periodic plan may differ from the first one, and the third from the second, but by that time permanency should have been reached.

3. It is to be regretted that these three sections are not printed separately from the rest of the details in our working plans. Only rarely do they, at present, take up more than a page of foolscap, so that the circulation of them to all divisions would not be very troublesome. If the Honorary Editor would, even in an entirely unofficial way, publish such a summary* for all working plans in India and Burma, or even simply a list or index of them, he would render great service to the department. Having thus brought matters up to date, there would probably be plenty of room in the ordinary numbers of the *Indian Forester* for summaries of new plans on publication, and for an extra index once a year.

At present, no one outside the Imperial Forest School or the Office of the Inspector-General has access to all the working plans in existence, and so it is often next to impossible to find out what has been done in other divisions.

* We should be delighted to publish brief summaries of this nature if the officers who prepared the plans or those now engaged in working them would forward them to us.—HON. ED.

In the early days of working plans in India, 100 copies of each were printed, and there was a pretty general circulation of them. Now-a-days only some 25 to 30 copies are issued, so that the books do not ordinarily travel outside a single circle, let alone into other provinces.

4. It must also be tolerably certain that our working plans contain much other information which it would be to the advantage of the service to have easily accessible. Representing, as they do, in a condensed form, the results of the study of a particular forest or series of forests, by specially appointed and professionally trained Forest officers, it is only reasonable to suppose that the observations recorded and the deductions made would be of material assistance to other officers engaged on similar work.

I have written one working plan myself, but there was little or nothing original in it. I read every plan on similar lines that I could get hold of, and made use of everything in them that I could. In my opinion every working plan officer should do the same.

All the information in working plans is more or less of interest and permanent value, but instead of issuing the books as they are to all officers, a better plan would be to take them to pieces and to issue summaries of them in a series of separate parts. Thus—

Series I.—Working plan proper.

(*Vide* para. 2 above.)

„ II.—Physical and general conditions.

Situation, soil, spring water level, configuration of ground, climate, etc.

Series III.—Growing stock.

The tree growth and the chief injuries to which subject.

„ IV.—Data.

Density of stock, growth in height and girth, and form factors of the principal species.

„ V.—Utilization.

Markets ; saleable products, etc.

Series VI.—Felling Regulations.

Main fellings and subsidiary ones.

„ VII.—Supplementary Regulations.

Fire, conservancy, roads, buildings, planting, etc.

5. The actual details and number of the above series would probably require further consideration, but there can be very little doubt that the publication of some such sets of summaries of all existing working plans would be very valuable, and the issue of similar papers in each series, on each new plan as it appeared, would make readily accessible to everyone much of what is known of the more important species in our forests.

The mere circulation of working plans in their ordinary book-form would not be so useful. Even if all officers interested in the *sal* or *teak* had access to the hundred or more plans in existence for each of them, still the load of the books could not be carted about in camp, and so they could only be used at headquarters. Even then, in order to learn something of any particular subject being worked out at the time, it would be necessary to wade through a huge mass of irrelevant material.

The Agricultural Ledger Series of pamphlets is an excellent example of the sort of thing that is wanted.* Each paper has a double set of numbers so that the papers can be bound in annual volumes or grouped in each special series as desired.

6. There should be little or no difficulty in compiling such summaries of working plans. In the first place, the authors of plans could be asked to put together the required summaries within certain limits of space. In other cases, the Honorary Editor could, doubtless, make arrangements. Once started, there should be no further trouble.

The summaries would not need to be in exactly the same words as in the printed books, so long as the information in them was the same. Supplementary information should appear in the form of foot-notes or in a "Remarks" column. As the

* The Annual 'Proceedings' published by the Director of the Geological Survey furnish an even better example of the kind of annual publication the department requires.—HON. ED.

summaries would not be, in any sense of the term, criticisms of the plans, authors of plans should have no objection to the publication of them, especially if given the first refusal of the drafting of them.

The order of publication would naturally be chronological, based on the dates of sanction. Only in this way would the plans themselves appear in their right perspective, and be of use in tracing the gradual development of the science of forest management in India.

31st October 1904.

X. Y. Z.

A LARGE INDIAN MAHOGANY TREE.

It may be interesting to readers of the *Indian Forester* to know the measurements of a magnificent mahogany tree which stands in the beautiful grounds of the Hyderabad Residency in the "Rung Mahal" Gardens.

Possibly this tree may be the biggest of its species in India. It is a pity that it was not pruned in its youth, since the bole is short. At breast height its girth is 16 ft. 4 in., but at the height of 9 ft. 3 in. it branches off into six different limbs, which vary in girth from 5 ft. to 7½ ft. The tree has attained a height of 130 ft. and is in fine foliage.

I presume its age cannot be more than 109 years, since I believe seed was first introduced from the West Indies to Calcutta in 1795. I have not been able to ascertain if the tree has ever seeded.

The Residency was commenced and completed during Colonel Kirkpatrick's tenure of office as Resident between the years 1797 and 1805.

HYDERABAD :
22nd October 1904.

W. F. BISCOE,
Conservator of Forests,
H. H. the Nizam's Dominions.

REVIEWS AND TRANSLATIONS.

THE REVIEW OF FOREST ADMINISTRATION IN BRITISH INDIA, 1902-03.

Readers of the magazine will perhaps understand why it is with very considerable trepidation that the writer answers to the demand made upon him to undertake a criticism of the Inspector-General's Annual Review of Forest Administration in India. The reviewer nowadays is expected to forsake that deep-cut track followed through 30 volumes of the *Indian Forester* and to produce an article containing originality combined with wise and delicate criticism instead of pursuing that easier and broader way which needs but the scissors and the gum bottle. Even this path would not, however, prove to be set with insuperable difficulties were it not for the fact that one has to endeavour to so choose one's terms and phrases that, whilst criticising favourably or unfavourably the report (since a review must necessarily do the one or the other), there should be no suggestion of praise (which we have heard termed gross flattery) of the Government of India on the one hand and of criticism of Local Governments or their forest advisers and staff on the other. We would ask our readers to bear in mind, however, that *cujusvis hominis est errare*—even possibly themselves when they betake themselves to the pen of criticism.

Very little alteration in the total area of the forests in charge of the Department took place during the year. A mention is made however of the fact that the proportion of area under forest management to that of the total area of each Province varies greatly, from 66·3 per cent in Burma to 3·9 in the United Provinces and Oudh, so that whilst the average for all Provinces amounts to 22·4 per cent, the proportion in each is not so satisfactory as might be inferred.

Forest Settlement work still proceeds apace, and Burma with 983 and Madras with 502 square miles of finally settled reserves are especially noted, the major portion of the 2,363 square miles undergoing settlement at the close of the year being situated in these two Provinces.

The remarks on the demarcation of forest boundaries will prove of interest, and the figures will not unlikely occasion some surprise. In the Bengal Presidency there are about 74,000 miles of forest boundary, in Madras 34,000 miles, and in Bombay about 45,000 miles. Some 5,469 miles still require demarcation in the Bengal Presidency; the Punjab being responsible for $\frac{3}{4}$ ths of this deficit; 1,859 miles are in Madras and 16,404 in Bombay, where the forest area consists, in many places, of small isolated blocks. At the present rate of progress demarcation will be complete in Bengal in about five years, in Madras in one year, and in Bombay in about fifteen years. The satisfactory progress of demarcation in Burma, where the forest area is being constantly increased by the addition of new reserves, is very noteworthy.

We are glad to be able to record that good progress is being made in the survey work. Whilst a good map is indispensable before a working plan can be drawn up for any particular area, it is almost an equal necessity to the Divisional Officer if his duties are to be efficiently carried out. During the year a total of 350 sheets has been published, including eleven working plans and other special maps. Advance tracings and chocolate prints when required for working plan purposes were also supplied to Forest officers.

The progress in that important branch of work, the preparation of working plans, is called "satisfactory," but the term is very considerably qualified by the remark "when it is remembered that the Department is in most Provinces short-handed, and that the deputation of officers for the compilation of working plans is often at the expense of equally important work." This remark applies only to the preparation. There is also the heavy work in connection with the drawing up of the preliminary notes, the revision of obsolete plans, and general supervision to be considered. We trust that the Government of India will soon see its way to the formation of a working plans branch, consisting of a special staff, which will be responsible, under the Inspector-General, for all working plans work. We think that there can be no two opinions amongst professional men as to the urgent need for the formation

of such a staff or as to the immense value it will prove, both to the Government of India and Local Administrations alike.

The total area under working plans is 33,264 square miles (Bengal, 25,851, Madras, 3,993, Bombay, 3,420), or roughly a little over one-third of the total area of the reserves.

The report notes with satisfaction that the importance of opening out communications and of erecting buildings is being recognised in most Provinces. The remarks on the former will bear quoting—"Of the Rs. 1,03,990 expended on new work, the United Provinces and Madras head the list each with an expenditure of over Rs. 19,000, which was closely approximated in Bengal. In the Central Provinces an outlay of over Rs. 14,000 during the year as compared with that of Rs. 829 in 1901-02 proves the intention of the Administration to afford facilities for the removal of forest produce. The small expenditure in the Punjab, in Assam, in Bombay, and in Burma appears to be regrettable. In the latter Province two Conservators remark on the absence of roads and on the result this must have on forest exploitation, while a third points out that the paucity of supervision and difficulty of procuring labour form a serious drawback to the prompt opening out of needful communications. There is probably no form of forest expenditure which has so much direct influence on forest revenues as the construction and upkeep of export roads and inspection paths, and liberal outlay in this direction is necessary if satisfactory and speedy development of the valuable State forests is to be attained."

"The expenditure on buildings, amounting to Rs. 3,26,116, shows an increase of Rs. 64,277, to which almost all the more important Provinces contribute their share. Assam alone shows a saving both on new works and repairs on the comparatively insignificant sum of Rs. 10,000 expended during 1901-02."

"Under new works Burma still heads the list with Rs. 50,000, followed by the United Provinces with Rs. 39,000 and Madras with Rs. 32,000; Bengal, Bombay and the Central Provinces coming next with Rs. 24,000, Rs. 23,000, and Rs. 20,000, respectively. The large increase in activity in Bombay is specially noticeable. The record

of the year under this head is most satisfactory as showing that the importance of providing shelter for the Forest staff has received adequate attention in most Provinces."

On the subject of Forest offences we read some remarks which would appear to be addressed to the Department at large. After commenting upon the various reasons assigned for local variations in the numbers of Forest offences the report continues—"Putting aside other causes as affecting results only to a minor extent, it may safely be asserted that any large increase in Forest offences denotes either that the restrictions placed upon the people are intolerable or that it is worth while to evade them. Both the intolerance and evasion may indeed be only temporary, due to a falling off in local prosperity for which provision should have been made in increased liberality in the utilisation of State forests; but when in normal circumstances, on which Forest rules and settlements are necessarily based, Forest offences increase in number, further enquiry into local conditions becomes desirable in order to decide between the requirements of the tenantry and those of the forest, in justice to both." We think that this note has the true ring in it, the note of the broad-minded, able forest administrator in contradistinction to those foresters who consider the reserved forests as so many sacred preserves into which no one unrobed in the sylvan garb and unarmed with the insignia of office may enter and from which the taking of a few dry sticks, the lopping of a few branches, the grubbing up of a few wild edible roots or the grazing of a few hungry cattle in times of stress is a matter for the criminal courts. Just so soon as the people realise that the closed forests are really their bank, upon which they will always be permitted to draw in periods of dire distress, so soon will the police work of the department be reduced to the irreducible minimum, and the arrival of this happy millenium is in the hands of the department alone.

"The area under protection from fire increased during the year by 1,763 square miles, the principal additions being made in Burma and the Central Provinces. It now reaches a total of 36,651 square miles. Of this area, however, a certain proportion is left without

the supervision of a special staff, with the inevitable result that fires are unusually frequent. In future it will be unnecessary to take such areas into account when considering the results of organised fire conservancy, for if a forest is worth protecting the expenditure involved in supplementing mechanical aids to success by the entertainment of a staff of watchers is also justified, and if it is not incurred those forests which are not specially protected may more conveniently be classified with others which, by their nature, are self-protected." We cannot but think that this point has been somewhat lost sight of in the articles that have appeared in the magazine on fire protection in teak forests in Burma and the questionable necessity thereof. One reason put forward by several of the writers has been that this work entailed keeping the Forest guards entirely on fire operations, and that consequently the Forest work and supervision suffered. Fire protection in its proper sense surely necessitates the entertainment of a special staff of fire patrols during the dangerous period, and if these men do their duty properly the Forest guards should be able to carry on their work in their customary manner. We view the decision now come to as a move very much in the right direction; and one wonders how a forest with merely a cleared line of greater or less width round it ever came into the category of 'fire protected.' Burma, where the difficulties of extinguishing fires can be easily understood, shows the highest percentage of fires, followed by Bombay. The remark that 'in certain circumstances the beneficial effects of the exclusion of forest fires are not apparent for many years may perhaps allude to the fact that the Government of India are more inclined to agree with the Local Government than with the writers of the articles on fire protection in teak forests as to the policy to be pursued in Burma.

Year by year the grazing question comes nearer to a satisfactory solution for those chiefly concerned. Only about 17 per cent of the State forests are closed entirely to cattle, and these in time of scarcity would be thrown open. We agree with the report that, in face of these statistics, it cannot be maintained that the interests of the agricultural or cattle-breeding communities are

subordinated to those of forest conservancy in India. Taken as a whole, the State forests provide a large proportion of the grazing grounds of the Empire and also constitute a reserve area which may, in time of need, be of the utmost importance. Under sylviculture the following remark appears to be more particularly applicable to Burma under present circumstances: "Operations for the purpose of aiding the natural reproduction of the principal trees do not appear to have been frequent, although they must in many cases be almost a necessity in these areas, where the effects of fire conservancy result in favouring the inferior growth. From some Circles are recorded interesting details of the progress of investigations or of experiments made in the endeavour to ascertain the reason of the failure of teak regeneration in protected forests. So far as these have proceeded it appears evident that the absence of sufficient light or the presence of excessive undergrowth are the retarding causes; but the problem of how to provide, over large areas of natural forest, for the former without inducing the latter is still unsolved."

As regards minor products investigations are said to have been in progress *in re* Musa fibre, cassava cultivation, the manufacture of wood and bamboo pulp for paper-making and the value of various latices of rubber-producing plants. "Much valuable information was collected, which will, it is hoped, lead to the utilisation of many forest products whose value has up to the present been overlooked or neglected." We think we are correct in saying that concerning some of these materials much information has been collected in past years by individual officers. Some of this has found its way into the office of the Reporter on Economic Products; other portions have remained stored in the heads of the individuals themselves, and the remainder, perhaps the major portion, has passed on to find its final resting-place in the voluminous pages of the formidable Annual Reports of a prehistoric generation of Conservators, or in the tightly-packed pigeon-holes of their offices. We are unable to perceive how such information is to be made available and useful to the department at large in the future until there is some form of annual official departmental

publication into which it can be collected and issued for general reference.

The following statement shows the outturn of timber, fuel, bamboos and minor forest produce from all forests, reserved, protected and unclassed, under the control of the Forest Department :—

Presidency			Timber and Fuel.	Bamboos.	Minor Produce.
			C. ft.	No.	Rs.
Bengal	{ 1902-03	...	181,345,643	282,851,296	27,27,405
	{ 1901-02	..	170,735,735	142,919,425	26,64,142
Madras	{ 1902-03	...	21,958,556	35,844,728	11,44,255
	{ 1901-02	...	18,730,441	39,217,618	11,90,567
Bombay	{ 1902-03	...	42,596,413	4,479,201	7,39,691
	{ 1901-02	...	42,13,4901	4,062,295	6,83,424
GRAND TOTAL	{ 1902-03	...	445,900,612	323,175,225	46,11,351
	{ 1901-02	...	231,001,077	186,799,338	45,38,133

This shows an increase of about 14 millions of cubic feet in the outturn of timber and fuel and 136 millions of bamboos; the latter mostly from Burma.

It will come as a surprise to many that the demands of grantees and right-holders absorbed about *one-third of the total outturn* from the forests of the State, whilst the total minor produce bestowed free of cost to private individuals living in the vicinity of the forests comes to approximately the same figure.

As showing that the forest estate is commercially on a sound basis, it is satisfactory to note that the gross revenue (Rs. 1,94,71,540) was Rs. 16,47,825 in excess of last year, and Rs. 7,83,982 in excess of the average of the past five years. The surplus amounted to Rs. 82,22,209, being Rs. 11,44,882 in excess of 1901-02, and Rs. 1,66,396 in excess of the average of the past five years.

The value of produce given free to those resident in the neighbourhood of the forests was Rs. 21,60,904 in Bengal and Burma, Rs. 64,053 in Madras, and Rs. 10,97,000 in Bombay. As is

customary, no credit was taken for this sum of Rs.33,21,957, which amounts to about one-sixth of the gross revenue collected in the State forests. Especially with regard to grazing is the liberality of the Government evident, as the value of free grazing equals the amount of revenue collected under this head.

The report alludes to the fact that twenty officers from the Imperial and Provincial Services were on foreign service during the year in Ceylon, Egypt, South Africa, Malay States, South Nigeria, Siam, Trinidad, Mauritius, etc., whilst applications from others, including several from Native States in India itself, had to be refused owing to the short-handedness of the staff and the impossibility of supplying the men. During the year there was no change in the sanctioned establishment.

In conclusion we would wish to look back a year and re-quote a paragraph* from the last Government of India report quoted in your review of last year. "The attempt to pursue these investigations" (*i.e.*, investigations into the economic and commercial value of minor products, etc.) "with the aid of a staff already fully occupied in the protection of the forests and in exploiting their major products must greatly restrict the sphere within which the Department has to confine its investigations, but with careful research, directed by men of experience and business capacity, it is probable that the true value of the various economic products of the forest will by degrees be ascertained and markets created for their disposal." In conjunction with this remark there was also a mention of the absence of a Forest Bureau of Enquiry and Investigation. We have looked in vain in the report under review for any further allusion to this important subject.

ÉCONOMIE FORESTIÈRE.†

A NEW FRENCH BOOK ON FORESTRY.

Mr. Huffel, of the Nancy Forest School, has just published the first volume of a new work on French Forest Economy, in which

* *Vide* Vol. XXX, 1. p. 30.

† *Economie Forestière*, by G. Huffel, Professor of Forestry at the Nancy Forest School, Volume I, published by Lucien Laveur, 13, Rue des Saints-pères. Paris.

the forests are considered from the point of view of human requirements and industries.

This first volume contains four parts—

- I. The Utility of Forests.
- II. Forest Properties and Forest Legislation.
- III. Forest Policy.
- IV. A Review of Forestry in France, and Statistics of French Forests.

Part I, on the Utility of Forests, is perhaps the most interesting part of the book for a non-Frenchman.

The first chapter deals with the various kinds of forest produce, both at home and abroad, and their importance, financial and industrial.

The second chapter gives a most interesting recapitulation of all the results of modern experiments and observations, both in France and in other countries, regarding the effect of forests on the climate of a locality.

The influence of forests on the temperature of the air and of the soils, on the hygrometric state of the air, and on the rainfall, is exhaustively dealt with, and the results of modern research in Europe on this interesting subject are very clearly set forth.

The third chapter is devoted to the influence of forests on springs and streams and on the subterranean water-level of a locality, and the results of all modern experiments and observations on these matters are plainly summarised.

A chapter on forests of protection follows, in which the utility of forests, and of artificial reboisement, in preventing torrents, avalanches, and moving sands, during the past century, is exhaustively reviewed.

The last chapter of this part of the book deals with the utility of forests as a means of obtaining revenue from waste, unculturable land, of draining swamps, of improving the atmosphere near towns, and of affording beautiful and beneficial resorts for the people.

Part II deals with the historical development of forest properties, whether belonging to the State, to village communities, or to private owners, and discusses the question of forest rights

A second chapter reviews the forest laws, ancient and modern, in France and in the French colonies.

Part III opens with a chapter on the taxation of imported timber and wood from the point of view of natural and political economy, and continues with a chapter on the responsibility of the State, and its right of interference in the working of forests in order to protect the general interests of the present generation and to ensure the welfare of future ones.

The third chapter of this part contains a very interesting historical review of the French Forest Service from the twelfth century up to the time of Bagneris and Broillard.

Part IV also opens with a chapter on the history of the forests of France from the earliest times up to the present day, and is followed by a general description of the principal forests in France, and their condition and value at the present time.

The last chapter is devoted to statistics of the forests and of the forest administration in France and in the French colonies

We can confidently recommend this most interesting and useful book to everyone interested in forests, whether French or otherwise, and we look forward with a keen anticipation of pleasure to the publication of the remaining two volumes.

AN INTRODUCTION TO THE STUDY OF FORESTRY.*

This is a small pamphlet, evidently the work of a non-professional forester, recently published under the auspices of the County Gentlemen's Association, Limited. We welcome its appearance most heartily, since it marks a distinct step in the right direction in that it proves that the question of afforestation in Britain is making progress, and progress amongst the very class who can most assist the good cause. Sir Harold Hewett's little work does not pretend to teach the trained forester anything. It is chiefly a compilation based upon Dr. Schlich's "Manual of Forestry" and

* 'An Introduction to the Study of Forestry in Britain,' by Sir Harold G. Hewett, Bart., London, The County Gentlemen's Association, Ltd., 2, Waterloo Place, Pall Mall, W. Price 2s. 6d.

Professor Gayer's "Waldbaum." In his preface the author states his reasons for drawing it up. "There are several works on forestry in the English language, and from time to time fresh ones appear. The principles laid down by the various writers agree in the main, but the methods recommended differ so widely as to bewilder a beginner who is trying to study the subject by himself. The object of these papers is not so much to teach forestry as to give a beginner a shove, so to speak, in the right direction ; to criticise, compare and, when possible, to reconcile the advice given by the various writers ; to be, in short, nothing more than an introduction to the study of forestry."

"With all respect to our British foresters, it is assumed that the principles of silviculture, as taught by Professor Schlich in his 'Manual of Forestry,' are sound." We professional foresters can assure Sir Harold and his readers that they will not be in any danger of going astray by their assumption.

Sir Harold begins by pointing out that it should be clearly understood that there are in Britain two schools of forestry—the old or British and the new or Continental. To the old school belong nearly all our writers, and most of our woods are worked on its system. The "Forester," by Brown, is still its standard work. In the host of other books one only need be noticed, "Practical Forestry," by Curtis, a second edition of which appeared in 1898. This book was written by a Professor of Forestry at Downton Agricultural College, and is laid down as one of their text-books by the Surveyor's Institution, and may be taken as representing British forestry up to date; it is worth a perusal as affording an interesting proof that the study of forestry in Britain is almost at a standstill. The 6th edition of the "Forester," edited by Nisbet, which appeared in 1894, may be said to mark the boundary between the two schools. In his preface Nisbet says it is an attempt "to engraft the modern continental science of Silviculture upon the old British stock of Aboriculture." Sir Harold designates it a jumble of advice which is confusing to the beginner. We then come to the standard work in English, Schlich's 'Manual' of five volumes, the first two of which our author considers are sufficient

for the student to begin with. Sir Harold, after pointing out that the difference between the two schools is that the new one is scientific whilst the old one is not, then considers his subject under the headings Shade-bearing Trees, Choice of Species, Nursing, Thinning, Underplanting, The Density of Crops, Improvement of Existing Woods, a very important subject, Measuring Woods, ending with a few remarks on the subject of the necessity of every forester having a small handy book of tables, formulæ, etc.

Whilst congratulating the author on his interesting work we could wish that, in these days of cheap publication, he had found it possible to issue it at a lower price. In a second edition we shall hope to see it appear at a shilling, which would place it within the reach of a larger circle of readers.

SHIKAR AND NATURAL HISTORY NOTES.

A TRIP IN CANADA.*

THE LUMBER TRADE ON LAKE HURON.

BY COL. G. F. PEARSON.

Parry Sound is the great centre of the lumber trade on Lake Huron, and my old instincts have brought me here to see how they do things. Here conservancy is truly at a discount, or rather of no account at all. There are three great companies at work, all busily engaged in cutting up trees into planks and scantlings at a rate that can only be realised by those who have seen it. I have just been over the works of the Parry Sound Lumber Company, which are the most up-to-date, and do 140,000 superficial feet of sawing each day of 10 hours—partly planks, partly scantlings. I have never seen, either in the Black Forest or elsewhere in Germany or France, anything to approach their machinery for simplicity and practical efficiency. The whole is driven by a horizontal 750 h. p. steam engine, which works beautifully. The smaller pieces are cut up

* Extracts from letters written to Mr. Eardley-Wilmot, Inspector-General of Forests, which he very kindly placed at the disposal of the Hon. Editor.

by a series of parallel chain saws, which drag the logs in sheets against the circular saw. But the most marvellous piece of machinery I ever saw of the sort was the heavy steel table which carried the heavy logs and worked backwards and forwards against a huge saw, which ripped through them as if they were butter. Two men only stood on the table to work the levers; a log was brought in on a trolley dragged by a chain; it was rolled on to the table, gripped by the levers, the side slit off, turned over and squared, and finally cut up into planks or scantlings in far less time than I have taken to write this, each plank being thrown out and put aside much like the sheets of the *Times* are thrown out and folded in the *Times* Printing Office.

Just think of the destruction of forests at about a million feet of sawing per week in this mill alone, and there are three big mills here all going, besides smaller ones. It must be a thriving trade too. Just now all sections of the trade are working at high pressure, and good lumbermen—the experts at the work called “Gangers”—are earning 100 to 120 dollars a month, that is, about £20 to £25 a month. Ordinary lumbermen get commonly 30 dollars a month and their keep, which in the forest comes to about another 23 dollars a month. From this you may judge the importance of the industry, and of how little use it is to talk to people here about their real interest in conserving the forests as the richest capital in the country. They assent to this at once when you talk to them, but they say that present interests are too great to think of it. You might as well talk to the coal owners in South Wales on the subject of preserving their precious supply of steam coal, which is unique in the world. Government is powerless to interfere, as private interests are so strong and so many thousands of men get their living by the works in either case. But it seems to me a sad thing that nothing can be done to regulate this fearful expenditure of capital.

The lumbermen are a rough and hardy lot of men and work all the winter in the forests, as all the timber is brought to the river over the snow. The men who work in the mills at Parry Sound get 1.50 to 1.60 dollars a day and keep themselves,

which they do for 15 to 16 dollars a month, so their pay is about the same as the others—about 8s 6d. a day. But they work ten hours for it, and work hard, which men won't do in England. Some of these men are wonderfully clever at their work, as I saw myself. You can hardly imagine what a rate the machinery moves at. As soon as the log automatically appears on the table, the man in charge has to estimate what it will cut up into, and as soon as the first side is ripped off, he sets the machine accordingly, and it is cut up. There seem to be few mistakes and no waste.

Sleepers, or "*ties*" as they call them here, are never sawn. They say they last twice as long if not sawn; they just take a tree about three-feet girth and cut it into lengths and roughly square it with an adze, and sometimes only just cut a place for the chairs.

The Manager of this great concern was a young fellow hardly over thirty, who had the direction of the whole works. He was most kind and civil, and a very clever intelligent man, full of interest in his own work and keen to hear about our work in India. I do not know what pay he received, but it was probably well over £1,000 per annum. He was a highly educated man, though he was dressed like and had the appearance of an ordinary lumberman.

The whole place is unique. It is like a typical backwood settlement on the shore of Parry Sound. All round, you may say for miles, you see nothing but lumber stacked up, which tugs and barges come to tow away; or it goes by rail from Rose Point close by. Most of the wood here is white pine, but there is a little red pine and hemlock.

Wood here is truly like gold and silver in the days of Solomon—"of no account." It seems to offend one's senses to see the waste. Walking round there are in every cove and every inlet and at every little stream hundreds and thousands of logs and even planks and scantlings in every stage of rotting away, and no one thinks it worth while to collect them.

There are a few good houses and stores, barber's shop, Methodist and Baptist chapels, etc., but most of the place is saw mills and rough shanties in which the lumbermen live. The Hotel

is quite a decent one, but very noisy, people coming in and walking about and having drinks and talking till after 1 A.M. at night.

To-day we go to Rose Point, which is a pretty quiet place round the corner of the Harbour, where they say there is a comfortable quiet hotel. Coming up here in the steamer from Pennetang on Lake Huron, which is about three hours by express train by rail from Toronto, I put up at a hotel on an island which belongs to (and the hotel is run by) Colonel Cautley, of the old 97th (now West Kent) Regiment. He is a grandson of Sir Proby Cautley, who built the Ganges Canal, and nephew of General George (Bengal Corps) and Colonel Dick Cautley, who used to live in the Dún. I spent three days very pleasantly there.

If you ever came this way I should advise your going to the Rose Point Hotel, a couple of miles off, a pretty quiet place, served by a launch which runs up the Harbour continually.

A DEAD ELEPHANT.

A letter in your number for June 1903 *re* a dead elephant has reminded me of a case I was unable to account for.

A timber working elephant on *must* and doing serious damage was shot in the hind leg. He was then fettered and turned into the jungle to recover, and after being there over a month was very nearly well enough to travel and get to work again.

The mahout saw him one evening, and next morning found him lying on his back, in a dry buffalo wallow, dead with his feet in the air and trunk spread over backwards as described in the letter referred to. No reason could be given for his death.

Unfortunately I could not get there in time for a *post mortem*, but up till the time of his death he had appeared quite fit and the wound was doing well. The wounded leg showed no signs of anything wrong and the bone was quite sound.

The only reason I could think of was that he had been sleeping by the buffalo wallow, had rolled into it and had not been able to right himself as his leg was still weak. In consequence he could not get off his back, and like a sheep when "cast" had died from the effect. Is this a possible explanation in this case and the case referred to in the former letter?

L. VALE BAGSHAWE,

Bombay-Burma Trading Corporation,

22nd October 1904.

Kindat, Upper Burma.

EXTRACTS FROM OFFICIAL PAPERS.

OBITUARY.

MR. J. MESSER, I.F.S.

It is with great regret we have to announce the death from blackwater fever of Mr. J. Messer, Deputy Conservator of Forests, Upper Burma.

Mr. Messer was appointed to the Indian Forest Service on the 1st January 1891, and was posted to Burma, in which Province the whole of his service was spent. He served both in Lower and Upper Burma, and was, at the time of his death, in charge of the Katha Division, Upper Burma, which, save for some six months' leave, he had held charge of for nearly seven years.

MADRAS FOREST MEMBER'S TOUR IN ANANTAPUR. *

Lord Ampthill, during one of his tours while Governor of Madras, was impressed by the prevalence of discontent with forest administration which existed throughout Anantapur and Kurnool districts. Mr. Sim, the Forest Member of the Board of Revenue, was accordingly deputed to tour through the two districts and

* These papers were kindly placed at the disposal of the Honorary Editor by the Board of Revenue, Fort St. George

enquire more fully into the complaints received. The Government of Madras have now issued their resolution on Mr. Sim's detailed report of his tour in the Anantapur district, and a perusal of the report produces the impression that after all there were very few causes of complaint, and only such as could easily be remedied.

The district is typical of the dry inland part of southern India. Bare, dry and famine-stricken, it is studded with a number of isolated rocky hills, and surrounded on all sides by land which in a year of good rainfall is cultivated right up to the foot of the hills, but which in an unfavourable season remains uncultivated, giving rise to the impression that there still remain large tracts of waste land awaiting to be brought under cultivation. In such a locality reservation is necessarily confined to the isolated hills, and its necessity is emphasised by the general bareness and poorness of the district. Under such circumstances reservation and afforestation must inevitably be accompanied by some measure of inconvenience, if not actual hardship, to the villagers, which must therefore be endured with as good a grace as possible.

The growth on these hills is at present miserable. It will never be good, but should with careful management suffice to meet the every-day requirements of the agricultural population. The treatment indicated is simple, *viz.*, rest, absolute and protracted—no half measures will suffice; and with this end in view the suggestion to import fuel and small timber from the neighbouring district of Kurnool is very sound. The experiment was tried some ten years ago in Cuddapah district, where a lead of fifty miles by rail was found to be the maximum possible without the Department losing money on the transaction. The railway, however, did *not* give special rates; and it is very unlikely that they will do so now that their dealings with the Forest Department have been so much restricted by the importation of coal.

Complaints were common that reserve boundaries came too near to villages and cultivation, but such a state of affairs is met with all over India, and, provided reservation is confined to areas unsuited to cultivation, little can be done. The proposal to exclude small portions of reserves adjoining cultivation

in order to provide standing-room for cattle used in cultivating is a makeshift and not likely to be conducive to any good result. Either the cattle have standing-room outside the reserves, if that really is what is wanted, or they have not, in which case some much more drastic step is indicated than cutting out a few square yards as a cattle-stand.

The old standing question of unrestricted grazing comes up again, and it is satisfactory to note that the principle that any reserve can accommodate as many cattle as exist in the neighbouring villages has not been admitted. In Anantapur the cake has been eaten and only the crumbs remain. Until a fresh cake is made, the reserved areas will stand only the very lightest grazing, and a perusal of the report indicates this as the rock upon which the attempt to re-afforest the denuded areas may come to grief. If any good is to result, heavy grazing within the reserves must practically cease. It sounds a severe measure, but it is indispensable. The proposal to reduce the grazing fees, already very light, by one-third has not met the approval of Government, and another proposal to allow the issuing of half-yearly licenses, which has been sanctioned, will give much extra work, more opportunity for oppression, and is likely to only give relief in a comparatively few *bond-fide* cases.

Complaint was made of the absence of boundaries and the consequent accidental trespass into reserves. That boundaries should be clearly indicated is essential, but few Forest officers will be able to agree with Mr. Sim when he says "that a system of external and internal belts of live thorns, twenty or thirty feet wide, on the block-house system, and with openings only at recognised intervals, would go far to stop theft, trespass and fire." A fence absolutely impassable *throughout its entire length* is perfect. Anything else is worthless as regards keeping out would-be trespassers. No fence which can be erected in this country with reasonably limited expenditure is capable of remaining intact for long against the attacks of man and beast. Indubitably both man and beast will attack it, and the fence, instead of fulfilling the part it was meant to, will remain a monument of misdirected energy. We

put no faith in the moral effect of interrupted fences, and think that the instances quoted in the report as furnishing examples of the good effect of such fences can scarcely be relied upon as trustworthy. The fences referred to were low stone walls erected in the famine of 1876; they are by no means intact and offer no appreciable obstacle to the passage of either man or beast. The most reasonable interpretation of the fact that the growth within those walled areas is better than in the unwallled ones is that in 1876 walls were erected around the best and most promising of the reserves.

A proposal to remove unclassed forests from the control of the Forest Department and once more place them under the subordinate Revenue authorities has been negatived by Government. The proposal was based on the ground that such a step would free the villager from interference and annoyance, and enable him to get his wood and other produce under cover of "a simple form of permit, bearing the village officer's recommendation and the tahsildar's sanction." It certainly does not sound a very simple procedure, and makes one wonder what the unfortunate villager could do in the event of the village officer being loath to give a recommendation or the tahsildar his sanction.

Numerous other points are carefully dealt with in the report, which is interesting and valuable not so much, perhaps, on account of what has been achieved by the deputation of Mr. Sim to make the enquiry but as showing that many of the causes of discontent are beyond the reach of remedy for the present at any rate, others are trifling or imaginary, and the remainder are not of such grave importance as to have necessitated the special deputation of a Member of the Revenue Board. Every one of them would, we are of opinion, elsewhere in India have been dealt with locally as the result of a thorough inspection by the Conservator, who is essentially an inspecting and advisory officer, or failing this a useless luxury.

MISCELLANEA.

THE EVOLUTION OF THE HORSE.*

Professor H. F. Osborn referred to the three independent lines of research being carried on by Professors Ewart, Ridgeway and himself, and hoped that they would be able to bridge the interval which at present existed between the fossil, the historic, and the recent races of horses. He gave an account of the explorations, begun three years ago, of the American Museum, which were rendered possible by a liberal gift from the Hon. W. C. Whitney. The object of this search into the fossil history of the horse was to connect all the links between the Lower Eocene five-toed and the Lower Pleistocene one-toed horses, and to ascertain the relations of the latter to the horses, asses, and zebras of Eurasia and Africa. The first result obtained is the proof of the multiple nature of the evolution of the horse during the American Oligocene and Miocene periods. Instead of a single series, as formerly supposed, there are five—one leading to *Neohipparion*, the most specialised antelope-like horse which has ever been found; a second, of intermediate form, probably leading through *Protohippus* to *Equus*, as Leidy and Marsh supposed; a third leading to the Upper Miocene *Hyphippus*, a persistently primitive, probably forest or swamp-living horse, with short-crowned teeth adapted to browsing rather than grazing and with three spreading toes; this horse has recently also been found in China. A fourth and fifth line of Oligocene-Miocene horses became early extinct. This polyphyletic or multiple law is quite in harmony with the multiple origin of the historic and recent races of horses as lately established by Professors Ridgeway and Ewart. The Pliocene horse of America still requires further exploration before it can be positively affirmed either that all the links to *Equus* are complete or that America is indubitably the source of this genus. The Lower Pleistocene of

* Abstracts of three Addresses given in Section D, of the British Association on 23rd August 1904.

America exhibits a great variety of races, ranging in size from horses far more diminutive than the smallest Shetland to those exceeding the largest modern draught breeds—yet all these races became extinct and did not survive into the human period as was the case in South America. The relations of these North American races to those of South America and of Asia and Africa is a subject requiring further investigation.

The address was illustrated by photographs of a large series of models, of osteological preparations showing the mechanism and breeds of the horse, and of the mounted fossil specimens recently discovered.

Professor Ewart referred to the fact that in pre-Glacial times there were several distinct species of Equidæ in the New World, and that one of the objects of the present inquiry is to connect the recent Equidæ with these or other extinct forms. Before it is possible to point out the connection between the true horses and the pre-Glacial or Pleistocene horses it is necessary to determine the number of species and varieties of the horse now extant. He described at some length Prjevalsky's horse, the Norse type of horse still found fairly pure in the north-west of Scotland, and the recently discovered Celtic pony. He referred to Prjevalsky's horse as the least specialised of living Equidæ, as evidenced by the character of its mane and tail and the presence of a complete set of callosities, and he discussed the question as to whether it is a mule or simply the offspring of Mongolian ponies run wild. The Norse type of horse differs from Prjevalsky's in its heavy mane and tail, finer head, and smaller ears. The Celtic pony is the most specialised of living Equidæ, as shown by the absence of such vestiges as fetlock-pads and chestnuts from the hind legs, and the presence of a peculiar tail-lock which adapts it for a subarctic habitat. Photographs were shown to illustrate these various features.

Professor Ridgeway then stated some of the evidence which led him to conclude that a distinct species or variety of the horse had been specialised in North Africa. Darwin supposed that not only was the Arab horse the result of artificial breeding by the Arabs

but that the dark colour of the English race-horse was due to the Arab dislike of light coloured horses. History puts it beyond doubt that the Arabs had no horses at the beginning of the Christian era, and that they obtained their famous breed from North Africa; and so far from their disliking light-coloured horses, they have a predilection, on religious grounds, for white or grey horses, as had the Germans, Greeks, and Romans. Bay and other dark-coloured horses were well known in Northern Africa and Western Asia many centuries before the Arabs owned horses. The horse appears for the first time on Egyptian monuments about 1500 B.C., and is almost always painted brown, and those ridden by Libyans and depicted on pottery (at Daphne, B.C. 660—570) are always painted dark. These horses were not imported into Northern Africa from Asia; on the contrary, Solomon (tenth century B.C.) and his neighbours imported horses from Egypt, which must have been of a superior race. These horses were obtained from the Libyan tribes (as none of the other peoples in that region possessed them), and from them also came those of Southern Spain, the ancestors of the Andalusian and Pampas horses. The Libyan horses passed into Sicily and Southern Italy, and in the games of Greece and in Roman times they were the fleetest known. The bay horse therefore not only belongs to Africa from the earliest times but was then, as now, the swiftest. The Libyan horses show a greater tendency to stripes than do Asiatic horses, and the former often lack hock callosities, which are present and of large size in coarse Asiatic horses. The tail of the Libyan horse differs in structure, covering, and carriage from that of Asiatic horses; the hoofs are longer, and the neigh is different. Libyan horses were docile, and could be driven without bit, while the peoples who used Asia-European horses invented the bit. Professor Ridgeway concludes that *Equus caballus libicus* is to be regarded as a distinct variety.—*Nature*.

FORESTRY IN WALES.

The little Principality appears to be making more stir on the subject of afforestation than any other part of the country, although

there is evidence of a general active interest all round. On Wednesday, the 7th instant, a Welsh National Conference of Delegates appointed by the Welsh County Councils to discuss the question of afforestation in the Principality was held at Swansea, Sir Charles Philipps, of Picton Castle, presiding. The Chairman, in referring to the great importance of the study of forestry, said that the object of that meeting was to consider how best to advise the County Councils. After reference to the report of the Departmental Committee of 1902, the speaker said that there was in Wales an enormous area which could be profitably afforested, and pointed to the fact that afforestation gave employment to ten men where sheep farming would only give employment to one. It was necessary that professors of the subject should be appointed at the Universities, and that practical demonstration areas should be set apart. One of the latter had been already established on high meadowland in the Forest of Dean. The view was expressed by Mr. E. Robinson, of Boncath, in course of discussion, that the establishment of a central school of forestry for Wales was of the utmost importance, and that such a school would become self-supporting after a few years. It was at length resolved that the members should urge on their respective Councils the great importance of the study and practical application of forestry by providing lectures to be given at suitable centres and bursaries, enabling students to attend these lectures; also that a central school of forestry be established with example plants of three or more acres, and demonstration areas of suitable extent, and that the necessary expense be defrayed by the County Councils on the basis of their respective rateable values, the whole amount now asked for not to exceed £5,000. It was further resolved to communicate what was being done to the Government Department, in the hope that a grant from the State would be made towards their efforts.—*Timber Trades Journal*.

FROM TREE TO NEWSPAPER.—In how short a time a tree can be converted into a newspaper was found out recently at Eisenthal, in Germany. At 7-35 a.m. three trees were felled in an adjacent forest, stripped and taken to a local paper factory. By 9-34 the first sheet of paper issued from the machines. The printing works of the

nearest newspaper were four kilometres distant. The paper was carried there in a motor-car at full speed, the presses set to work, and exactly at 10 a.m. the newspaper was ready printed. The whole process from the forest to the reader thus only took two hours and twenty-five minutes.

THE COCHIN FOREST TRAMWAY.—The Cochin Forest Tramway is to be extended by twelve miles into Challacoody at a cost of Rupees two lakhs. The object of the extension is to avoid the delay and wastage consequent upon a process of floating the timber which it was originally intended to follow. By the extension of the tramway into Challacoody this difficulty will be entirely obviated, and timber can be brought down from the forest at any part of the season without waiting for the flooding of the rivers. After the proposed extension, the whole line of the Forest Tramway will cover a distance of forty-five miles, and Mr. Haffield, the Special Engineer, expects to complete the line before 1906.

THE TRANS-FRONTIER TRADE OF BURMA.—In the 'Record of the Trans-Frontier Trade of Burma,' a publication which was kept so heavily pruned during its compilation that much that would have been of the greatest interest and value to the reader has been left to such imagination as he possesses, we note that there is an increase of 22·49 per cent in the imports from the Southern Shan States, chiefly due to cattle, stick lac and timber; there was only a very slight increase in the export trade owing to diversion to the railway at Maymyo. There is very little doubt that the construction of a railway on this part of the frontier would result in a considerable expansion of trade, as means of transport are at present very deficient. The trade with Southern Siam showed the big increase of 279·52 per cent, the imports being chiefly cattle, elephants and silk piece-goods, and the exports jewellery and silver. The trade in elephants is probably a temporary one; there was a keen competition for them among Burmese merchants, but neither the supply nor the demand could be kept up to last year's figures for long. In Northern Siam also, where trade increased by 36·41 per cent, the chief items were cattle and elephants. The revival of trade with Siam is largely due to the tranquillity which

has succeeded to the recent unrest in Northern Siam. Both in connection with Siam and Karenni there was a falling off in the quantity of teak exported to Burma, but a large increase in value, teak being in growing demand, and much more difficult to obtain than was formerly the case. The Siamese forests are partially closed, and in Karenni there is more and more difficulty in extracting teak from the forests.

THE TIBETAN ANTELOPE.—Captain R. L. Kennion, writing in the *Pall Mall Magazine* for October, on the antelope in Tibet mentions that not many years ago this particularly graceful beast could be seen in large herds in the Chang Chenmo and adjacent valleys of Ladak on the northern Kashmir frontier, but of late they have been driven eastward, till now they are scarcely found to the west of the Tibetan border, while to see them roaming the plain in any considerable numbers one has to travel far into the forbidden country, and reach a land inaccessible to all globe-trotters and un leisured persons. Everyone has heard how the Tibetan antelope scrapes for himself a hole in the ground, in which he lies so still that his long, slender horns look like dry willow shoots sticking out of the ground; and it was only this morning (says Captain Kennion) that my wife had pointed out with delight three little beds side by side in the sand—a big one, a smaller one, and a very diminutive one, evidently the resting-place during the night of some “papa, maman, et bébé” of the timid wilderness folk. Antelope are very pretty beasts, standing about thirty-two inches high. Their colour varies from brown to fawn, the under part being a lighter shade, almost white. Under the short, stiff hair lies a loose layer of wonderful soft white wool, which is woven into exquisite pashmina. This can be plucked out in handfuls, and is valuable. Their slender horns have a graceful curve, and frequently have a high polish in the natural state.

SCIENTIFIC TREE BUTT BLASTING.—Stately and well grown timber adds much to the grandeur of an estate, but nothing looks more untidy than a lot of old tree butts lying about, which often prove dangerous to horsemen and cattle.

The old primitive method of removing tree butts by grubbing, wedging, stocking or burying was tedious and expensive—the latter extravagant when firewood is taken into account.

The new system of blasting tree butts by electricity and "geligonite" (a safety explosive) appears, however, to be an efficient way of getting rid of these troublesome encumbrances.

Some very successful experiments in blasting butts have recently been carried out on the Right Hon. Lord Leigh's Stoneleigh Abbey Estate, near Kenilworth. The tree butts comprised elm, ash, alder and oak, some of the latter estimated (with earth attached) to weigh ten tons.

Mr. Thos. Johnson, of Kate's Hill, Dudley, attended to conduct the experiments. The last two butts to be taken in hand were elm of immense size lying close to the river, in the park. A hole $1\frac{1}{4}$ inch diameter was bored with a Gilpin auger into each of the butts; these being charged up with geligonite, an electrical detonator was inserted and attached to the main cable of the battery. All being ready, the operator retired some fifty yards away behind a huge oak tree, gave the handle of the battery a few turns, when the monster butt was blown into suitable pieces for loading up.

The work was done under the guidance of Mr. A. Wilson (Head Forester), and is regarded as a thorough success, and expeditiously carried out.

BIGGEST TREE ON EARTH.—The United States is, of course, a country of vast possibilities, but in the tree line, at any rate, we were under the impression there was nothing new to be discovered. Apparently in this we are wrong, as, according to a newspaper paragraph which is going the rounds, a well-known lumber mill man of Fresno, California, claims to have found a giant sequoia tree, 400 feet in height, and measuring 109 feet round the base. It is in a secluded gully in Tulare country, and is believed to be the largest tree on earth. We can only hope that it will be spared the woodman's axe.





Imperial College of Forestry, St. Petersburg, Russia.

INDIAN FORESTER

FEBRUARY, 1905.

THE IDEAL FORESTRY COLLEGE.

GENERAL REMARKS.

HAVING recently had the opportunity of visiting some of the best Forestry Colleges and Institutes existing in Europe, we have thought it might serve a useful purpose at the present juncture to give, within the limits of a short article, our impressions as to what an ideal Forest College or School should be, the said views being based upon a careful selection of the best points seen in the various institutions visited. That these deductions have had to be entirely drawn from continental experiences is due to the well-known fact that the British Empire is still without a representative Forest College, even the Forestry branch built up at Coopers Hill being now in the final stage of its existence. *In forma pauperis* the Department now awaits the Government decision as to the nature of the establishment which is to rise on the ashes of Coopers Hill.

It is well understood that it is not essential that all forestry institutions should be equally provided for in the matter of staff and equipment, since their scope varies greatly; some are devoted to the training of the superior staff, whilst others concern themselves solely with that of the subordinate one. A primary object of all tuition given in a College or School which endeavours to inculcate the principles of forestry and forest work is that the greatest attention should be paid to training the powers of observation of the student to their highest possible pitch. That this should be done is needful for superior and subordinate alike: for the faculty of true and close observation and deduction from observation is the fountain head of all forest education. In all forest educational establishments therefore it is needful to supplement

the lecture room by the laboratory and the laboratory by the museum, and all three by liberal practical work in the field. Whilst the following article more particularly considers the arrangement and contents of the Forestry College required for the education of recruits for the Upper or Controlling Service of the Department, much that it contains will be found to apply to those institutions whose scope is limited to the training of the subordinate ranks.

In describing the requirements which we deem essential for our ideal College we will consider the matter under the heads of Situation, Buildings, Staff, Studies, arrangement of the main educational building its libraries, lecture halls, laboratories, museums, Professors' rooms, etc., College Gardens and College Educational Forests.

SITUATION.

The first question which arises in connection with the formation of a Forest College is its situation. It is necessary that it should be placed in the vicinity of wooded areas, and the more plentiful and varied are these latter the better for the purpose in view.

It should be possible for the student, within the limits of short walks, to study the commoner species of trees, shrubs and herbs, the zoological fauna, etc., with which he is beginning to make acquaintance, perhaps a first acquaintance, in the lecture room; for under the present existing entrance examination for the Imperial Indian Service there can be no certainty that a forest probationer has even the most elementary acquaintance with Nature. To plant a Forest College in a flat, treeless country would be to damp the ardour of the student at the outset, just at the very period when it is most essential that it should be stimulated. Coopers Hill in England and Tharandt in Germany serve as excellent examples of what the environs of a Forestry College should be like.

BUILDINGS.

To be of the fullest use the College should be self-contained; in other words, not only the students but the major portion of the Educational Staff should dwell within the College precincts. For

this purpose several blocks of buildings are required. First and foremost comes the main educational building. This should contain, on a liberal scale, lecture halls, museums, laboratories and Professors' and Students' working rooms. In addition to the main building there would be, in the grounds, suitable quarters for the Director of the College, with separate blocks of quarters for the resident Professors and the students. It is better for these latter to reside in a building apart from the main building if feasible. In the grounds would also be situated a good gymnasium and open areas for recreation purposes.

STAFF.

The question of staff is one which must ever be placed in the forefront where any educational establishment is under consideration, for efficiency is so often made subservient to a cheese-paring economy, and the finest College in the world is useless unless properly manned with the necessary number of Instructors. It is well understood that no one can teach with any degree of satisfaction or usefulness any subject other than his own, and this is perhaps more especially the case when the subjects are scientific ones. Both in the French and the British Institutions we have examples of a false economy necessitating the one Professor teaching both his own particular subject and one or more which he has had to 'get up' in order to lecture upon them. The students can easily distinguish between the two. The one subject they really learn something about. In the others *damnunt quod non intelligunt* very well expresses the attitude taken up.

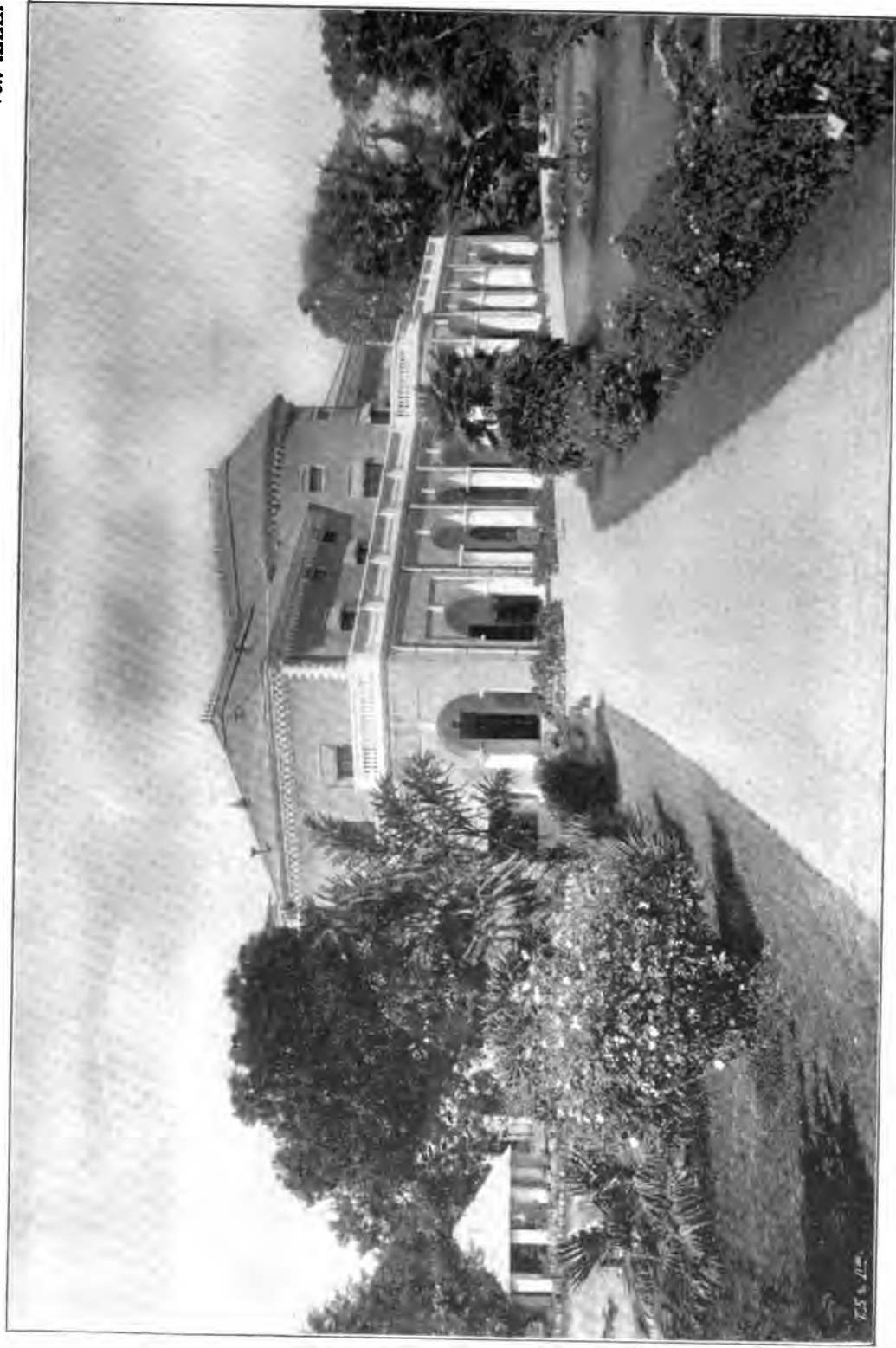
In addition to a Director, who would be in charge of the whole institution, together with its instructional forests, we consider our staff requires nine Professors, who would deliver lectures in Forestry in all its branches, and Forest Law, Botany, Zoology, Chemistry, Surveying and Forest Mathematics, Geology, Mineralogy, Physics and Drawing. As examples of Colleges provided with such staffs we may instance Tharandt in Germany and St. Petersburg in Russia, the latter, however, owing to its much greater size has twelve Professors. Many of the Professors require assistants, who are responsible more or less for the museums, for the setting up of specimens, putting

them out for exhibition at lectures, and for assisting the students when visiting the museums out of lecture hours. In the German Schools we find that each of the Professors in Botany, Zoology, Chemistry and Physics, at least, is provided with such an assistant, whilst in the St. Petersburg Institute, where there are 500 students, all training for the Upper Controlling staff, there are no less than 15 assistants. The importance of having such subjects as we of course need not allude to Forestry, Botany, Zoology, Geology and Chemistry taught by specialists in these subjects and of providing them, where possible, with assistants cannot be too strongly advocated. In Germany these latter are often students of the College who have finished their course but, having shown a special aptitude for some particular branch, are kept on a year or so longer; they will eventually either go into the forest or replace the Professors in their own or similar educational centres. Whilst this latter would not be feasible at present in the case of a British College, it would, we think, be quite practicable to keep on a promising student for a couple of years or so, allowing him to draw the pay and allowances of his rank, whilst thus qualifying himself as a specialist in his particular branch. The work such a man would do when he eventually joined the Department would well repay the extra educational advantages afforded to him, whilst he himself would be of the greatest use to the students in residence during the years of his extra deputation.

CURRICULUM.

There is little necessity for considering here the subjects which it is essential for the future Forest Officer to study at College: they are well known. There are, however, two points which may with advantage be touched upon. The first is connected with the knowledge possessed by the student when he first enters the College. Few who have studied the question at all can doubt that he should come in with an elementary knowledge of Botany and Applied Science, including an elementary course in Zoology and Anatomy. Further, that he should have a liking for scientific subjects. That a student entering a Forestry College with a knowledge of classics and perhaps of modern languages only is more





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than likely to prove a lamentable failure as a Forest Officer will perhaps surprise but few save the Public School Master. The second point more particularly applies to our British Schools of Forestry, and it concerns the instruction given in the subject of Forest Zoology. The importance of this branch of the work has had but little recognition, and the tuition in it has been of so inadequate a nature as to preclude the student from attaching to the subject in his after service the importance which it undoubtedly deserves, and which it receives in Germany, France, Russia and Austria.

THE EDUCATIONAL BUILDING.

We will now consider briefly the arrangement of our main building. We have already seen that it will consist of libraries, lectures halls, museums, laboratories, Director's and Professors rooms, etc. Following the plans of the best continental Colleges, the rooms devoted to special subjects will be arranged in suites so that the lecture hall appertaining to a particular subject will have the museums, laboratories, etc., of that subject contiguous to it.

THE LIBRARIES.

The general library of the building will contain a complete set of works on Forest subjects, both in the language of the country for which the College serves as an educational institution and also in those of all the important forest-conserving countries of the world.

That such a library should be as extensive and as up to date as possible would be a *sine qua non*. This library would be directly under the administration of the Director, but would be available daily to professor and student alike. In addition to this main library each professor would have his own special one in his working room, containing such works of reference as he constantly required. All more costly and rarer works would find their place in the general reference library.

THE LECTURE HALLS.

In so far as practicable each subject should be provided with its own lecture hall, and this more especially applies to those subjects in which the lecturer requires to show a large series of

specimens during the delivery of the lecture or to prepare series of experiments. Thus, for example, separate lecture halls should be provided for such subjects as Botany, Zoology, Chemistry and Physics, to mention a few. Where, through economy, it becomes necessary to use the same lecture halls for several subjects, the different lectures, coming one immediately after the other, necessitate the professor curtailing the number of his exhibits owing to the impossibility of getting them into the hall and arranging them in time for the lecture. This in itself, since it is a disadvantage to the student, is a sufficient plea for the necessity of separate halls. Where possible the lecture halls should be so disposed that they may open out on the one hand into the museum devoted to the particular subject and on the other into its special laboratory.

THE LABORATORIES.

It is scarcely necessary here to dwell upon laboratory requirements. There are few branches of science in which a laboratory or practical working room is not an essential part of the instructing staff's equipment. For convenience it would be so arranged as to be contiguous, or as adjacent as possible, to both museum and lecture hall. In the German Schools separate laboratories are provided for Botany, Zoology, Chemistry and Soils, and Physics.

THE MUSEUMS.

In all educational establishments where any subject which treats of the constitution of the world we live in, its structure and rocks, its fauna and flora, etc., is dealt with, a first desideratum is a good Museum. But although latterly this has come to be recognised to a certain extent in the British Empire and has long been fully understood by the more enlightened continental nations, the object in view is often defeated by the internal arrangement of the museums. It is considered that all that is required is that collections should be made or bought and placed in the room or rooms set aside for museum purposes, without any particular attention being paid to the proper grouping together of the various objects exhibited. For instance, a collection of butterflies will be

shown alongside specimens of pickled fungi; jars of pickled fish mixed up with lizards and scorpions, also in spirits, whilst a series of spirit specimens of beetle and moth larvæ will be placed amidst a collection of mineralogical and fossil specimens. To the student new to all these various objects their appearance leaves but a confused jumble of objects on the brain without the possibility of his acquiring a true knowledge of their proper place in Nature's Kingdom. Even the more experienced worker cannot but find his attention wandering when, wishing to study botanical specimens, he finds them mixed up with zoological or mineralogical ones. For a Museum to be of real service it is absolutely essential that each of its branches which deals with a special subject such as, *e. g.*, forestry, botany, zoology, mineralogy, chemistry, physics, etc., should be kept distinctly apart. In our College we would have separate rooms or suites of rooms for each branch. If it is possible to so arrange that each Museum is contiguous to the lecture hall and laboratory to which it belongs, the ideal will have been attained; this latter exists in the Tharandt, Munich and St. Petersburg Forest Colleges. Coming now to the subjects which should be given separate Museums in, if possible, separate rooms (if the latter is not possible some method could be easily devised to sharply mark off each separate branch so as to avoid all chance of confusing the student, provided that sufficient space is available), we have the following list:—

1.—*Forest Woods (including forest fungi and examples of hypertrophy).*

A complete set of specimens of the woods of the country would be shown both in the form of hand specimens and in larger blocks so that the student could come to recognise the appearance of the wood in bulk; these large pieces would have the bark on one side in order that the student could become familiar with its appearance. A collection of the commoner forest fungi and examples of hypertrophy in woods would also be included here for the use of the Forestry lecturers on these subjects.

2.—*Forest Instruments and Models.*

This collection would be made as complete as possible, but

it would not be necessary to include in it inventions which have not come into practical use in the forest. The number of such is already too large to prove anything but confusing to the student. The collection of models would to a certain extent depend upon the configuration and forests of the country for which the Museum is being made.

3.—*Forest Wood Craft.*

A complete set of shooting and hunting implements would be shown, special attention being made to exhibiting those in use by poachers in the forest areas so that the student might become acquainted with their appearance. The different kinds of bullets, sizes of shot, and the various animal traps, fish traps and nets, etc., would also be shown. Further, a complete set of the slots of the animals common in the forests of the country would be prepared for the student's use. These can be easily made by taking or obtaining impressions of the foot-marks in sand mixed with a certain amount of gum. This Museum might be included in the Forest Instruments Museum or be placed in No. 4.

4.—*Forest Products Museum.*

In this Museum would be shown all the minor products which the forests produced, as also examples of the various ways in which the various woods and products were used, such as, *e. g.*, joinery, agricultural implements, wood toys, tannins, fibres, lac, dyes, etc., etc.

5.—*Botanical Museum.*

This Museum would contain a set of hand specimens of the woods of trees and shrubs and a series of the fruits and seeds of trees, shrubs, and herbs ; specimens of tree and plant fungoid diseases and examples of hypertrophy. Also a herbarium and, if considered useful, some models showing the structure of the different parts of plants. Also a complete set of fibres.

6.—*The Zoological Museum.*

This would be divided into three parts. The first would comprise a complete collection of objects to illustrate the lectures given on the Animal Kingdom as a whole, only representatives of each class or group being exhibited. The second part would show

a representative collection, named throughout, of all animals to be met within the forest areas proper, in open woodlands, grass lands contiguous to forests, in fact all the animals which the Forester is likely to meet with in the course of his daily work. The third portion of the Museum would be the Economic Section. In this would be set up as far as possible in a life-like manner all the pests destructive to forests; examples showing the method in which the damage is done would be shown with the specimens themselves. When the animals themselves are very small, enlarged drawings would be shown alongside in order that the student might make himself acquainted with the aspect of the particular pest. The best Museum we know of this nature is Dr. Pauley's Zoological Museum at the Forest branch of the Munich University.

7. *Chemistry and Soils and Rocks.*

A representative collection of the various soils of the country would be shown in small tin boxes arranged in sloping desk cases. Above each soil would be exhibited in a glass picture frame a dried mounted specimen of the plant or plants most characteristic of that soil. A collection of characteristic rocks would also be shown here. In the best German Schools the apparatus used for soil analysis is also exhibited, and the students are shown how a soil analysis is carried out.

8. *Geology Mineralogy and Fossils.*

Collections of the various minerals, precious stones, ores and fossils are shown in this Museum.

9. *Surveying.*

A collection of all the surveying instruments used in the surveying course given to the students is kept in a separate Museum to which they have access in order that they may make themselves thoroughly acquainted with these necessary adjuncts to their work.

10. *Physics.*

All the physical apparatus used in the lectures is kept in the Physical Museum or Laboratory as it is usually called.

Museums on some such lines as laid down above will prove of the greatest service to professor and student alike, and their

formation and upkeep is a first desideratum of our Forestry College. The tending and upkeep of some of them becomes a serious consideration. Additions are constantly coming in and require to be set up, specimens require renewing, and there is a large amount of supervision constantly necessary. This is the work which falls to the assistants in the German and Russian institutions, and it is the absence of such assistants which has resulted in the Nancy Forest School Museums falling behind the high standard maintained by the others. At our British Imperial Forest Schools we would like to see this question of proper museums taken up in a thoroughly efficient manner. Owing to a false economy in past days they are admittedly far below the standard we have given above for our ideal College, and this ideal is by no means unattainable as is demonstrated by the continental Schools.

THE DIRECTOR'S, PROFESSORS' AND ASSISTANTS' ROOMS.

In addition to the rooms set apart in our main building for the Director and his assistants or clerical staff, the continental Schools recognise that each professor requires a separate working room in which he can prepare his lectures, keep his more valuable specimens, his special library and carry on his researches out of actual lecture hours. This room should, if possible, form one of the general suite devoted to his own branch of instruction, and would communicate with his assistant's room should he be provided with one.

As an illustration of the above remarks we may describe here the suite of rooms devoted to Botany at the Munich Forest College. Two rooms are devoted to Plant and Tree diseases, the collection being a complete European one. A third room contains a series of exhibits of the seeds and fruits of plants arranged in glass cases, also a set of fibres. A fourth small room contains a large series of portions of branches and stems of trees showing the results of lightning strokes and the effects of electricity on the wood. This has been arranged by Prof. Tubœuf himself, who is making a speciality of this study. A fifth room contains a collection of the woods of forest trees, the specimens being used to illustrate the botanical lectures. This series of rooms forms the Museum proper. We then come to a magnificent botanical laboratory containing

every facility for study and research. This contains a collection of tree fungi in spirit in a glass case, the herbarium and a number of other objects on which research is proceeding. The laboratory opens out into a conservatory, where various experiments in connection with growth were being carried out at the time of our visit. Students who show promise are encouraged to work in the laboratory. Next to this latter are the professor's and assistants' rooms, both well fitted with appliances, the former with a good botanical library. Beyond these again is a fine lecture hall. This latter is confined entirely to the botanical lectures, the walls being hung with diagrams of dissections of plants, picture frames containing young dried plants with their root system attached, etc. In addition there is a workshop room for packing and unpacking specimens sent out and received from the forests, and finally a dark room for photographic work. This completes as fine a series of rooms devoted to one important branch as can be desired. Above in the same building is another series, no whit inferior, devoted to Zoology.

STUDENTS' WORKING ROOMS.

Since the lecture halls are each reserved for special branches of the course, and are therefore not available for the students' use save during lecture hours, it is necessary to provide the latter with rooms in which they may study at hours when it is not convenient to them to retire to their private quarters. For this purpose we would set apart special working rooms in the main building, one being confined to each 'year' or promotion of the students. Whilst such rooms will prove of great benefit to the students themselves, they are also of use to the professors, who are able to set up or hang up specimens or diagrams which they have been exhibiting in the lecture rooms. These are changed at intervals as the lectures demand, and in this way the student has constantly before him exhibits bearing upon the subjects he is reading about at the time. A simple wall rack will enable dried specimens of plants or diagrams to be slipped in and locked in in safety, whilst a sloping desk rack enables cabinet drawers to be slipped in and exposed in a similar manner without danger to the specimens.

By the provision of students' common working rooms a privacy is guaranteed which cannot be obtained in the public lecture rooms, these latter becoming little better than lounging places or passages if used for this purpose.

Our College would of course require the usual bursar, store-keeper and curator, porters, etc.

Leaving the College building, we now come to a consideration of what is required for the practical demonstration work in the field, which forms so essential a supplement to the theoretical work in the lecture room.

THE COLLEGE GARDENS.

As an example of what a Forest College Garden should be we cannot do better than instance Tharandt. Situated on the side of a steepish hill, several acres are devoted to the growth of trees, indigenous and exotic, shrubs and herbs. The garden is so planted that the species are more or less arranged in their natural orders in the beds, and in addition to containing all the cultivated herbs and perennials, areas are allowed to run wild and fill themselves up with wild flowers and weeds. Every tree, shrub and plant is named, its order, Latin and popular names being attached to the label. Here the student may come and study pure Botany as taught by his botanical professor or follow the forest lecture course of forest botany with ease and profit. The greatest trouble has been taken to introduce exotic trees, with the result that a very fair knowledge may be obtained of trees other than the ones belonging to his native country. Such a garden requires constant attendance and constant additions, and in it the student should be, and is, allowed to roam at will. In addition to the botanical garden and arboretum space is also devoted to a forest nursery in which young trees of many varied species are reared. In this the student is shown, and can study for himself, exactly how the young trees, which are at a future date planted out in the forest, are grown. The forest nursery forms an important part of the forest garden.

THE COLLEGE FORESTS.

We hold the opinion that to every Forestry College some



Large Birch Trees in the grounds of the Imperial College of Forestry, St. Petersburg.



forest areas should be attached for instructional purposes. This is usually the case on the continent, and as instances we may quote the Tharandt and St. Petersburg College Forests. In each case considerable areas are attached to the institutions and they are placed entirely under the Director of the College. Although a satisfactory revenue is obtained from these forests, this latter is entirely subordinated to the chief object for which they are kept up, *i.e.*, that of forming instructional centres for the use of the students. Perhaps nowhere can such forests be seen to better advantage than in Tharandt, where considerable sums of money have been spent with the sole object of providing the best possible training ground for the embryo Forest Officer. They have here ideal students' forests, abounding with almost every species which grows in North Europe. The College forests should be managed by departmental officers directly subordinate to the Director.

These College Forests, however, are not sufficient in themselves for the instruction of the students. For their longer tours and final practical course a further set of forest areas should be carefully chosen, and for this purpose we think the Russian plan has much to recommend it. M. E. Kern, the gifted Director of the St. Petersburg Forest Institute, has adopted the following plan: One hundred and fifty forests were carefully selected from the great forest areas of the country as affording special advantages for training purposes. Only fifty of these forests are visited in any one year, and this procedure minimises the extra work and trouble which the advent of forest students into a division must inevitably throw upon the divisional staff, since the invasion only occurs once in three years. Of course, the staff in charge of these forest areas are in no way subordinate to the Director. A further improvement of Director Kern's is that the students work in the forests in pairs from the very outset. Throughout the whole of their four years' course they are never taken about in bands. The great advantage of this plan will be obvious to all who have had practical experience of how much is assimilated during the tours conducted on the 'troop' system.

SCIENTIFIC PAPERS.

THE INSECT PESTS OF SWIETENIA MACROPHYLLA.

BY P. M. LUSHINGTON, I. F. S.

THE growth of *Swietenia Macrophylla* in Nilambar is so remarkably rapid that, were it not for its numerous enemies, its introduction would be an undoubted success. There is only one really big tree which is found in the middle of teak planted in 1872, which has a girth of 82 inches and a height of 95 feet, but there are many trees of good growth, notably some of 12 years old, which have reached a girth of between 5 and 6 feet and which are yielding good seed. Unfortunately, in its early years, the spotted deer browse down any seedling of this species that they can find, whilst the sambhar pick it out as a suitable tree on which to rub their antlers. Protection against enemies of this nature is however not difficult, and though this considerably adds to the expense of introduction, yet it is effective. It is, however, almost impossible to protect it against insects, whose injuries to the tree have to be seen to be believed. Not only do these insects kill off the younger plants, but I have seen well-established trees of 4 feet in girth completely killed by them, whilst even in bigger trees large branches are killed out. A study of these insects seems therefore very desirable, and anything in the way of identification may lead to a possible means of extermination. Defoliation of the young plants is fairly common, and the cause seems to be a buprestid beetle, which I have found in great numbers. Specimens of these are being identified by the Government Entomologist. More serious damage seems to be done by an insect which I have been unable to discover. This attacks the leaves, but more especially the midrib and sometimes the young shoot. The parts attacked turn brown and on the midrib and shoots a scar is left, and the woody portions become subsequently affected. I am inclined to suspect that this damage is done by a small beetle allied to the Rose beetle, for, though I have never found this on the mahogany, it is plentiful

on the neighbouring blackwood trees, where it damages the flowers and flower-stalks in a similar manner. I notice that it emits a black fluid, which appears to be injurious to the leaves. Far more serious is the damage to the leaf-buds. The leaf-bud is completely eaten away, and the insect then appears to tunnel into the twig. Innumerable instances of this kind of damage are to be found, but none of them of recent origin. From the damage done, which is exactly that described by T. S. G. in the *Indian Forester* and quoted by Mr. Stebbing on page 123 of his "Injurious Insects," I am inclined to suspect the *Magiria* (*Hypsisyla*) *robusta** as the cause; more especially as I see that damage to mahogany by this insect has been reported from Nilambar. Apart from these, however, there is a serious attack going on now which is evidenced by the leaves dying off suddenly on considerable-sized twigs. This damage is not due to any of the insects noted above, but a careful search has revealed three species of Bostrychid beetle. Of these by far the worst is a small brown Bostrychid, which enters the twig at intervals of two or three inches apart; a deep tunnel is then grooved out all round the outer part of the twig, which is almost invariably lined with a white substance. This girdling of the twig, inside the bark, appears to make the woody portion of the twig accessible, for the subsequent tunnellings are made into the wood itself, and the eggs deposited in them, and these galleries are also lined with a white substance. This appears to be nutritious, because when the young are hatched it seems gradually to disappear. The young consume the wood in all directions and render the twig quite hollow, and when they have left, these hollowed-out twigs afford refuge to ants, small bees and a variety of insects. I specially noticed one large tree which had not less than fifty twigs killed off in this manner and a few fair-sized branches. The beetle itself is very minute, not more than $\frac{1}{15}$ th of an inch in length. Very similar damage is done by a larger black Bostrychid, whose borings are fairly numerous and also white-lined, but I have only found one specimen of the perfect insect and one specimen of

* In a subsequent letter Mr. Lushington informs us that he has procured specimens of this insect and was able to identify it as being the pest.—HON. ED.

what I believe to be its larval form. The third species is another minute black Bostrychid which seems to work in conjunction with the brown one. It is very numerous, but does not seem to have the power of girdling which the brown one possesses and penetrates directly into the wood. Its galleries are not lined, and I believe the damage done by it would be insignificant but for its habit of working in conjunction with the brown species. Altogether this tree seems to be a perfect repository for insects, and, being a valuable one, seems to demand the attention of the Forest Entomologist.

Having recently received specimens of the insects alluded to by Mr. P. M. Lushington in the above paper I have been able to make a few preliminary identifications and observations upon them :—

The Buprestid beetle is *Psiloptera fastuosa*. This insect has been previously reported from Nilambar as injuring the teak plantations by boring into the wood, presumably in its larval state (*vide* 'Injurious Insects,' p. 39). Should Mr. Lushington be able to corroborate this observation it will tend to prove that the planting of mahogany with teak is directly in favour of the beetle.

The beetle considered as allied to the Rose beetle, and reported as damaging the flowers and flower-stalks of the Rose wood (*Dalbergia latifolia*) is a species belonging to the genus *Serica*. Several other species of this genus are now known to commit damage in this way, and it is probably one of considerable economic importance in India. It is not at all unlikely that the species here alluded to also attacks the mahogany, and it will prove of interest if Mr. Lushington can prove that this is the case.

The life-history of the tûn borer (*Hypsisyla robusta*), as far as it is at present known, is described in Departmental Notes on Insects that Affect Forestry, No. 2, p. 312.

The beetles alluded to as Bostrychids are three species of the bark and wood-boring family of *Scolytidae*. The small brown one girdling the twigs is a species of *Xyleborus* or a closely allied genus. The damage done by this pest appears to be very considerable.

The large black insect is a species belonging to a genus about which little is known in India. The larva supposed to belong to this insect, belongs to quite a different family, the true Bostrychids, *Bostrychidae* (for the difference *vide* Vol. XXIX, No. 1, 2, of this Magazine), it being provided with three pairs of legs, one pair on each of the three segments following the head. This larva may prove to be that of a species of *Sinoxylon*.

The third beetle mentioned is probably a species of *Tomicus*, a wood-eating genus of the *Scolytidae*.

Mr. Lushington's note is a most valuable one, and I trust he will continue his observations. During ten days spent at Nilambar towards the end of August 1902 I found a grub of a weevil boring galleries in the succulent bark of the mahogany trees in the Aravallikavu Plantation. These galleries penetrated down to the sap wood. One two or more galleries take off from an irregular shaped central chamber.

The attack can be recognised externally by a flow of gummy matter, which exudes from the attacked area and drips down the outer bark, coagulating in irregular-shaped sticky masses. These evidences of the presence of the grubs in some numbers were visible upon the main stems and also on the larger branches. I procured some specimens of the grubs and pieces of bark, but the latter dried up and the former consequently died before pupating; the mature insect has not yet been procured.

In addition to the attacks of the larva of the moth *Zeuwera coffea* (*vide* 'Injurious Insects') young saplings also have to fear those, which are probably by far the most important, of a longicorn borer, only the grub of which is at present known. I was able to see the evidence of these attacks in the interior of the wood of some trees which were split up. It is very desirable that the life-histories of both the weevil and the longicorn borer should be worked out.

I trust to be able to furnish a further note on the *Scolytidae* when I have more fully studied these pests. — E. P. STEBBING.

ORIGINAL ARTICLES.

JOSEPH MESSER, I. F. S.

Before these pages appear in print many of our readers will have heard of the sad death of Mr. Joseph Messer, from black-water fever, on the 25th November 1904. Taken ill on tour, he was brought back, in a very serious condition, to Katha, in Upper Burma (where he had been stationed for over seven years), and expired two days later.

Mr. Messer was thirty-five years of age and had nearly fourteen years' service, having reached Burma on the 1st of January 1891. For the first five and a half years of his career he was mostly employed on Working Plans. In July 1896 he took furlough for fifteen months, and on his return in October of the following year was gazetted to the charge of the Katha Division, and, with the exception of six months' leave in 1902, he remained in charge of this Division till his death.

When Mr. Messer first took charge of the Katha Division it had a most unenviable reputation for fever and was justly regarded as a penal settlement. Although the Division had been eleven years in existence, forest work was still in its infancy, and Mr. Messer had a wide field in which to exercise his remarkable

faculties for organisation. The northern portion of the Division has been lately formed into the Myitkyina Division, but since the separation of the latter but little has been done, so that in estimating the progress that was made under Mr. Messer's efficient administration it is only fair to take the combined figures for the two Divisions. During the seven years 1896-97 to 1903-04 the area of reserves increased from 420 to 758 square miles and the area under fire-protection from 320 acres to 554 square miles. The revenue increased from Rs. 1,39,073 to Rs. 6,15,892; the expenditure from Rs. 56,033 to Rs. 1,91,918, and the surplus from Rs. 83,040 to Rs. 4,23,974. This is a splendid record for any Division, but it by no means represents the full value of Mr. Messer's fine work. He was a great believer in fire-protection, as the above figures show, and he had hoped to protect every acre of his reserves in another two years; but he also believed in creeper-cutting and works of improvement going hand in hand with fire-protection, and he expended much energy in these necessary operations. All creepers have been cut over nearly the whole area of his reserves, and works of improvement to free the young teak have been started in almost every reserve and are being pushed forward as fast as the limited staff will allow.

But it is probably in connection with the experiments for the natural regeneration of teak that Mr. Messer's name will be chiefly remembered. Full details of these have already been published, but, briefly, Mr. Messer ascertained that by merely cutting the low brushwood in the neighbourhood of seed-bearers and burning it plentiful natural regeneration was induced, and that by a further burning the second year results equal to those of a first-class taungya were obtained at a nominal cost. The full value of this discovery cannot yet be estimated, but if the simple procedure is found suitable for all classes of teak forest our expensive system of taungyas and regular plantations will be a thing of the past, and we shall obtain better and more natural results at a fraction of the cost, whilst being able to deal with far larger areas.

Mr. Messer was a most hard-working and keen Forest Officer with the soundest views on technical matters, and his death will be

a severe loss to the Department. His life's recreation was his work, and outside of this he had few interests. He understood the Burman thoroughly and could get good honest work out of the most unpromising material. He had been so long in one Division that he *knew* his men as it is given to few Forest Officers to know them; he was honoured and respected by all with whom he came in official contact, and his death will be greatly felt.

Mr. Messer leaves many sincere friends to mourn his loss. His kind, sympathetic and genial nature had endeared him to them, and on all sides are heard expressions of deep regret at his sudden death.

The value of his work was recognised outside his own Department, for, on learning the sad intelligence, His Honour the Lieutenant-Governor of Burma had the following telegram despatched to the Conservator of the Circle in which Mr. Messer had been serving :—

“The Lieutenant-Governor desires me to say that he is deeply grieved to hear the sad and unexpected news of Mr. Messer's death. The Government have lost in him a very valuable Officer, who had earned for himself a high reputation and whom they can ill-spare. Sir Hugh Barnes asks that his sincere sympathy may be conveyed to Mr. Messer's family.”

We can only endorse this kind and sympathetic message.

NURSERY TREATMENT OF DEODAR IN JAUNSAK.

1. *Collection of Seed.*—The seed is collected from sound, vigorous trees in October-November as soon as the cones are ripe. Fresh seed is gathered every year for sowings, as the seed rapidly goes bad and cannot be stored for more than one year.

2. *Site for Nursery.*—A. N.-E. or N.-W. aspect is preferred with a water supply near at hand. Whether watering will be necessary or not depends on the locality and season.

3. *Preparation of Seed Beds.*—The soil is thoroughly worked to a depth of about 9" and good humus soil is mixed with it. The

beds are made $2\frac{1}{2}$ ' wide and are raised about 4" above the surrounding level of the ground.

4. *Watering*.—Watering may be necessary in the dry months preceding the rains. Water is run into trenches alongside the beds and allowed to percolate through them without flooding them.

5. *Season for Sowing*.—The best season for sowing is November-December soon after collection of the seed and just before the snow falls. Sowings may, if necessary, be made early in the spring, but they do not give such good results as the winter sowings.

6. *Method of Sowing*.—The seed is sown in rills 3" apart across the width of the beds. Where there is fear of drought, especially with spring sowings, it is an excellent plan to cover the seed beds after sowing with moss, which may be pegged down to prevent its being blown away.

7. *Treatment of Seedlings in the Nursery.*

(a.) *Ordinary method.*

November-December	...	...	Seed is sown.
Spring (March-April)	...	...	Seed germinates.
1st July (7 mos. after sowing)	...	...	Seedlings pricked out 4" x 4" into other beds.
2nd "	(1 yr. 7 mos. "	")	" " " 6" x 6" " " "
3rd "	(2 yrs. 7 mos. "	")	" planted in the forest.

(b.) *Basket plant method.*

November-December	...	...	Seed is sown in nursery beds.
Spring (March-April)	...	...	Seed germinates.
1st July (7 mos. after sowing)	..	..	Seedlings pricked out into baskets.
2nd "	(1 yr. 7 mos. "	)	" " left undisturbed in their baskets.
3rd "	(2 yrs. 7 mos. "	)	.. " planted in the forest in their baskets.

This method of using basket transplants is by far the best. The plants are usually stronger and healthier, because they have been less disturbed; but their chief advantage lies in the fact that they can be put into the forest with the minimum risk of damaging the roots.

The baskets are made of the small hill bamboo (*Arundinaria falcata*) called locally "Ringal." They are of cylindrical shape about 9" high and 6" diameter, and cost about one rupee eight annas per 100.

Transplanting in the Forest.—Holes are dug 18" deep by 12" diameter at distances 4' × 4' from centre to centre, and the planting is done just before the rains commence. Fig. 1 illustrates this

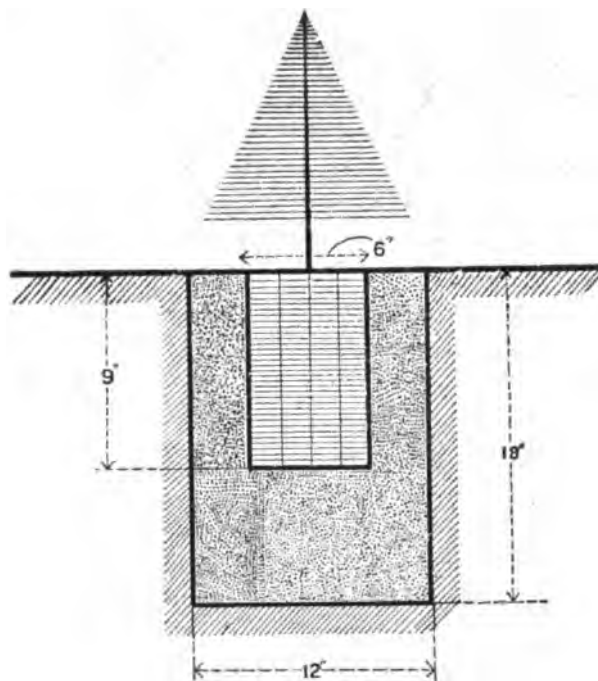


FIG. 1.—METHOD OF PLANTING OUT BASKET-TRANSPLANT.

method. N.-W. and N.-E. aspects are the best and the soil most preferred is a light rich moist one with good drainage; on hot aspects the transplants require protection.

Cost of formation of one acre of plantation at an average distance of one mile from the nursery.

		Rs.	a.	p.
Sowing and tending in the nursery for 2½ years	3	8 5
Price of 2,822 baskets at Rs. 1-8 per 100	42	5 3
Digging holes 18" deep × 12" diam. at Re. 1 per 100	55	2 10
Planting 4' × 4' apart at Rs. 1-15-3 per 100	28	3 6
Total	129	4 0

or approximately Rs. 130 per acre.

B. O. COVENTRY,

The 17th September 1904.

Deputy Conservator of Forests.

CORRESPONDENCE.

ON CERTAIN IMPORTANT FOREST QUESTIONS.

In your number for November 1903, now a year ago, you were good enough to print a note of mine on the above subject. My note has called out, as was to be expected, a good many criticisms, and, thinking that it might make the discussion complicated, seeing that most of the critics are in India and I am in England, to answer their remarks piecemeal, I have thought it best to wait for the expiry of the full year and then to ask you, Mr. Editor, to let me make some sort of reply to those who have discussed my note, most of them, I am very pleased to acknowledge, with kind personal reference to myself.

My subjects of last year were, put shortly,

1. The tendency to subordinate conservancy and improvement, especially in Burma, to the production of revenue.
2. The tendency to make people believe that knowledge of natural science, especially of botany, is unnecessary for a Forest officer.

The *first* of these was suggested by a comparison of remarks made by one former Inspector-General (Col. Pearson) in your number for August 1903 with those made by another (Sir D. Brandis) a few pages off; the *second* by a perusal of remarks made by the latter in which he contrasted the love of sport with the love of botany and entomology, saying that they were both "useful helps" to a Forest officer, but "are not forestry." You will see, Mr. Editor, that I accept the correction made in your footnote at p. 491, though the correction was hardly necessary if one went by the general sense of the whole and by previous writings and not by specific words.

The remarks and replies to my note, which I now propose to deal with, are—

- (1) Mr. Mercer's letter, at p. 566, of the number for December 1903.

- (2) Mr. R. S. Hole's letter, at p. 65, of that for February 1904.
- (3) Dr. W. Schlich's letter, at p. 116, of that for March 1904, with your own supplementary remarks.
- (4) The letters of Mr. Hauxwell and Mr. S. Carr in the number for March and May 1904, respectively.

There was also a letter on "The Use and Abuse of Forest Work in Burma" by "Burman" at p. 71 of the number for February, 1904, which I do not propose to discuss except to assure him that he is totally mistaken in supposing that my referring to Sir D. Brandis as the "old Forester" was done "slightly," for it was intended in exactly the reverse sense, as, I feel sure, most of the readers of your magazine will have understood.

Mr. Mercer's excellent letter is of much value, and shows that the recent Inspectors-General agree in the opinion which he quotes as having been Mr. Hill's, *viz.*, "that insufficient money was being laid out on permanent improvements and that the percentage of *net* to *gross* revenue had no business to be higher in India than on the continent of Europe, etc." That opinion quite reflects my own, and I was well aware that Mr. Hill and I were in accord, for we had frequently discussed the subject together, both personally and in writing. But the Inspectors-General that I had in my mind when I wrote last year were not Mr. Hill and his successors, but his predecessors, who were in office during most of my own service in the Department. My reference to "Presidencies where forest matters are not so directly governed by the Inspector-General's advice as they are in the North" was not a very well-chosen periphrasis for the 'Bengal Presidency.' I ought not to have brought in the 'Inspector-General' at all, for, after all, he is only the advisor of Government in Forest matters. Mr. Mercer shows this quite clearly in his letter, which gives a good exposition of a sound forest policy and explains how the first stage of forest finance came about, how it has now passed away, and how a second stage has now come in with a policy which we may all hope will add to the prestige and efficiency of the Department.

Mr. Hole's letter takes up the 'botany' subject. He is not quite accurate in his quotations, for I rejoice to say that I nowhere used

the words "the man *in the street* with the collecting tin" the italics are mine, and I fail to trace in his notice in the *Indian Forester* for August, 1903, the opinion credited to Sir D. Brandis that vernacular names "have a fixity which systematic names do not yet possess." I understand that Mr. Hole has now gone to the Dehra Forest School as Instructor and I would suggest his testing, on his tours in the School Circle, the value of the vernacular names in use: he will not find such a fixity as he seems to have found in the Central Provinces. As a sort of object-lesson, let me recommend to his notice the Himalayan names for the chief conifers; and especially a comparison between those used in Jaunsar with those of the Sutlej Valley to the west or the Ganges Valley to the east. And if he can get hold of a copy of the 'Prodrromus Floræ Peninsulæ Indiæ Orientalis' by Drs. Wight and Walker-Arnott (1834), let me recommend his perusal of the opinion given by these botanists, with their quotation of Dr. Wallich, at p. xxiii of their Preface. Sir D. Brandis added when he used the expression, quoted at p. xiii of the Preface to the "Forest Flora of North-West and Central India," the words 'in many instances,' and his remarks in that Preface are merely intended to show that sometimes vernacular names may be of considerable value and importance, and that scientific names also are liable to alteration, propositions which nobody is likely to desire to doubt. Of course Mr. Hole's jokes about the "pale and studious systematic botanist," the "mutilated fragments of trees," and so on, are simply 'tall talk' of which we may hope he has now become a little ashamed; at any rate I can hardly be expected to discuss them. He is on safer ground when he finally contends that Sir D. Brandis and I hold, after all, opinions which do not differ very greatly, for I have found it difficult to reconcile Sir D. Brandis' bracketing of botany and sport as useful helps to a forester, *though not forestry*, with what I used to understand were his opinions when Inspector-General. For my own part, of course, I have little to alter in or add to the opinions I expressed last year, which is that in such a country as India, where a Forest officer is liable to transfer to work in all sorts of forest growth of the most diverse character, a knowledge

of botany sufficient to enable him to use such books as there are and to recognise tree-characters, is indispensable, and, as I also remarked last year, the Forest officer who cannot use his gun on occasion, is sometimes liable to go without his dinner. But time spent by a Forest officer on botanical observation is time spent in the work of his profession, while I do not think that can fairly be said to be the case with shikar. More botanical observation is very badly wanted, for as yet we know very little about the habits and sylviculture of any but a few of the chief Indian forest trees and the study of the sylvicultural requirements and idiosyncracies of such trees and their economic value must begin by being made precise by their accurate identification.

The next letter to be considered is Dr. Schlich's, with your remarks upon it, and all I can say is that neither you nor he can have read carefully what I wrote. I never, for a moment, proposed to myself to discuss either the *quality* or the *quantity* of the botanical teaching at Coopers Hill or Dehra Dun. The quality of the teaching is obvious to anyone who knows the attainments of the three distinguished Professors who have taught at Coopers Hill, and I have always understood that ample time was given to the subject ; but there is an old saying that you can take a horse to the water but may fail to persuade him to drink, and I had a very distinct fear that if students are led to believe, by the statements of persons of influence and authority, that one of their subjects is, though part of the curriculum, not one of much importance, they are likely to neglect it and only study it perfunctorily and just sufficiently to 'scrape through.' Of course! botany is well taught at Coopers Hill ; whether it has always been quite the sort of botany that is wanted for our purposes is another matter, but as the College is so soon to cease to exist, it is not now worth while further to discuss the subject. I might, however, make the remark that, although Professor Marshall Ward is one of the highest authorities on the fungoid diseases of trees and must have taught about them to some extent, but one of his old pupils, so far as I know, has yet attempted to pursue the subject in India, and yet it is a subject of quite as great an importance as is that of the noxious

insects. On the other hand, several of his old pupils have been doing excellent work in systematic botany 'probably led to it by such considerations as those I have put forward, and have, I believe, added considerably to the knowledge of the species with which Indian foresters have to deal and which are the raw material of forest work.

And here I should like to point out what a magnificent field the more out-of-the-way forests of India still offer to those who can add something, however small, to the sum of our knowledge of Indian natural history; for nobody in India has such facilities for doing it as Forest officers have. The Forest Department has already a considerable 'roll of fame' both in botany and zoology; but India, as a whole, is as yet only imperfectly explored, and though I know that several Forest officers are at present doing a great deal, I think there must be others who can help as well when in camp, without very great interference with other duties. It is a common and very true saying that every forester is a student all his life; that to those who observe, new ideas come every day, and observation of the natural objects of the forests is surely a part, and a very important part, of the study, and may also help to relieve the tedium of many a long and often otherwise uninteresting march. My idea of what the Forest Department should be in India is perhaps Utopian, but it is at any rate a high one. Except the Geological and Botanical Surveys, which are quite small and special, it is the only Government agency in India which has to deal with natural history, and I have in my mind the Forest Department as the pioneer of scientific work, ready for the time, which must assuredly come before long, when the present purely literary system of Indian education and the selection of officers for service on purely literary grounds will come to an end.

I find I am leaving myself but little space for a consideration of the letters of Messrs. Hauxwell and S. Carr, letters which I have read with considerable interest in the expectation of finding complete answers to the propositions I put forward last year. I have certainly found a fair series of excuses, but not much of definite value in opposition to what I asserted. The first point I mentioned

was that forest management is being subordinated to the production of revenue, and I do not find that this is proved to be as fallacious as Mr. Hauxwell thinks it. Mr. Mercer more or less admitted that such used to be the case, and both Mr. Hauxwell and Mr. Carr consider that things are all right now. I can only hope they are, and that what Mr. Carr has shown to be the case in Pyinmana as to the restriction of girdlings only to forests under Working Plan or open forest that it is not intended to maintain permanently, is true for other districts also.

On the subject of selection, demarcation and settlement, Mr. Hauxwell shows (and Mr. Carr's figures are much the same) that in ten years the area of selected permanent reserves rose from 6,674 to 18,606 square miles, which is a rise from about 3·8 per cent to about 11 per cent of the area of the province. If 64 per cent is the area of 'Reserved and Unclassed' forest, it follows that no less than 53 per cent of it still remained in 1902 to be gone over, which seems to show that my contention that such work is behind-hand is not so far wrong. Doubtless there are reasons, but I wrote about what I thought to be facts and not about possibilities. And here I may perhaps suggest that nothing has as yet, that I know of, been attempted in Arracan,* although the important reports of Dr. Schlich in 1869 and Dr. Nisbet in 1882 showed that, merely from the timber point of view, to say nothing of climatic and water-supply considerations, the forests were worthy of attention. I think too that I have heard that in these matters some parts of the older Province of Lower Burma are still a good deal neglected. May I here remind Mr. Carr that I nowhere said that "the Burma Forest

* In a former article our correspondent made some very apt remarks on the subject of 'loose writing.' It is a pity that he does not apparently invariably act up to his own convictions in this respect. The following information will doubtless prove of interest :—

Since about the end of 1892 an Extra Deputy Conservator has been in charge of the Arracan forests with the following staff :—*Exec.*—2 Dep. Rangers, 2 Foresters, 6 Revenue Collectors and 8 Guards. *Cler.*—2 clerks, 2 peons, 2 dak-runners, &c.

The following staff has now been applied for :—*Exec.*—1 Dep. Conservator, 1 Asst. Conserv. or a Provincial man, 5 Rangers, 7 Dep. Rangers, 16 Foresters, 18 Revenue Collectors, 20 peons, 1 steersman, 4 rowers (for patrol boat), 20 Guards. *Cler.*—5 clerks, 12 peons, 5 dak-runners, &c. — HON. ED.

Officers' energies are altogether devoted to ruining the forests under their charge ;" to put such things down as my sayings was surely going a little too far !

On the question of fire-protection, I can find nothing whatever to gainsay the accuracy of what I said. The discussion on the subject of fire-protection has interested me a good deal, but the writers of various recent articles in the *Indian Forester* are, it seems to me, rather at cross-purposes. Some writers seem to be only acquainted with forests where fires are merely ground-fires among dead leaves ; and others write from experience of huge fires in long grass : let us hope, as I feel sure is the case, that the Conservators know how to adjudicate between them. Mr. Hauxwell admits that the provision of communications and buildings is behind-hand, as I knew it to be ; Mr. Carr seems to think that by "houses for the staff" I meant officers' rest-houses ; but what I meant, as Indian officers would readily understand, were houses for the Range and Beat officers who have to be supplied with suitable quarters in convenient localities if they are to be made properly responsible for their charges.

On the question of preparing beforehand for the possible flowering of bamboo, I am very glad that Mr. Hauxwell can assure us that the plan of campaign has been decided on, and I can only hope that it will not be pigeon-holed, as seems to have been the fate of my attempts to work up the 'Bhabar' grass industry in Ganjam, in regard to which he seems to have got a bit 'mixed.'

Finally, in regard to cutting teak for revenue, I do not think that I anywhere said that it was being "over cut, with a view simply of raising revenue," though I admit the soft impeachment that I certainly thought it was, not perhaps deliberately but without sufficient previous calculation ; and I believed, and do still believe, that the note of triumph which is usually sounded when a year of big surplus comes and the pat on the back which the officers who produced that surplus usually get, is very likely to tend to over-cutting. I have no means *now* of proving my belief, statistically or from personal knowledge, and I am quite willing to express my satisfaction if my forebodings prove to be wrong. The well-considered plan

which Sir D. Brandis says has been in force since 1856 was a makeshift one, as everybody knows; but it undoubtedly did good work for a time pending the introduction of Working Plans; and I am very glad to see Mr. Hauxwell's assurance that such plans will in future be prepared at the rate of 1,200 square miles annually, though even at that rate it will have taken about 15 years to finish off the area of 18,606 square miles which he gives as that of the Reserved forests of 1902.

I think that I have been able to show that Messrs. Hauxwell and Carr practically admit most of what I put forward, though they show that there are good excuses in some cases; I hope they will now admit that my writing was not so very careless after all. At any rate, I can only express myself as being quite impenitent still in that respect.

29th November, 1904.

J. S. GAMBLE.

THE TIMBER OF BARRINGTONIA RACEMOSA.

At page 363 of the last edition of the 'Manual of Indian Timbers' Mr. Gamble describes the timber of *Barringtonia racemosa* as "white, very soft and porous," and gives the weight of a cubic foot as 27 lbs., taken from a specimen collected by Kurz in the Andaman Islands; but at the same time he mentions that Skinner gives the weight as 53 lbs. per cubic foot, and the value of P. as 819, and says that the "wood is used for house and cart-building, and that it has been tried for railway sleepers."

There are therefore two opinions about the timber of this tree, one describing it as soft and worthless, the other as strong and serviceable. In order to clear up the doubt I have obtained and tested specimens of it, and I am able to confirm the statements of Messrs. Kurz and Heinig that it is soft and worthless.

To the description given by Mr. Gamble I would add that the pores are very numerous, almost filling up the whole space between the medullary rays, which are broad and clearly seen.

My specimen when first cut weighed 44 lbs. per cubic foot, but in three months it has dried down to 28 lbs. The value of P. is 302.

It is impossible to believe that this timber could ever have been used for house or cart-building, and much less could it ever have been tried for railway sleepers, nor could anyone say that it is strong and serviceable. In a word, Skinner's identification cannot have been correct, and his remarks must have referred to some other timber.

QUILON :

T. F. BOURDILLON.

30th November 1904.

FIRE PROTECTION IN THE TEAK FORESTS OF BURMA.

Under this heading your November number contains an estimate by H. S. of the damage done to standing crops of teak by forest fires, which is stated to be based on figures supplied by Mr. Rodgers. So far as I am aware, these figures only related to girdled trees, and as H. S. makes no allowance for loss of increment, for mature trees which were so damaged by fire as to be unfit for girdling, or for trees which as a result of fires have been either killed or rendered incapable of ever reaching exploitable size, the estimate appears to be somewhat incomplete. Surely 58 years of forest fires must have had some influence on the above factors, and until we have some reliable information on these points, such estimates can hardly I think be accepted as representing even approximately the actual damage by fires per square mile per annum.

G. A. F.

A DOUBLE CANE.

Some time ago Mr. Muriel brought to notice that a bamboo may have a double longitudinal cavity, and I conceive that the median wall would greatly enhance the stiffness and strength of the bamboo.

I have lately received through the kindness of my friend Mr. Watson, the Divisional Officer, a present from an old Karen headman named Ko Po, living in the Kabaung reserves, of a double cane, probably *Calamus latifolius*, Roxb., *yamata*, Burm. This cane, having apparently been split or cracked in the middle,

has grown into two parallel canes, at first half-round but presently quite circular in section.

It would be interesting in this manner to propagate the stout species of cane of half their normal thickness, thus increasing the proportion of cortical tissue and the strength and flexibility of the cane, which in this instance is used for the rafting of timber.

I have never before seen an example of this kind, and think that it must be rare. Would this 'freak' be worth sending to the Forest School Museum?

RANGOON :
23rd November 1904,

F. B. MANSON,
Conservator of Forests.

The Director, Imperial Forest School, would be very pleased to receive specimens for the Museum.—HON. ED.

PROMOTION IN BURMA AND INDIA.

I do not wish to controvert any of the facts stated by 'Taw Kwe' and Mr. S. Carr in their letters which appear in the October and November numbers of the *Indian Forester*, relating to the transfer of senior men from India to Burma; but when they assume that the men in Burma must as a consequence have been badly treated in the matter of promotion compared with their contemporaries in India, the facts do not bear them out. Mr. S. Carr invites comparison of the position of any man in Burma of 15 years service or less with that of a contemporary in India, and is confident that the latter will have a big advantage. I will therefore proceed to make such a comparison in the case of two men who have rather more than half the 15 years service mentioned by Mr. Carr. The man in Burma we will call B, the man in India H.

B became Assistant Conservator, 1st grade, with one and a half year's service and provisional Deputy Conservator, 4th grade, with a little over 5 years service, just at the time that H became provisional Assistant Conservator, 1st grade. With about 6 years service B became permanent Deputy Conservator, 4th grade, and again at the same time H became permanent Assistant Conservator,

1st grade, a position which he still occupies, having moreover no prospect of promotion for another two years. The difference in the pay drawn by B and H is much larger than these differences in permanent promotion at first suggest, owing to the prescriptions of Article 135 of the Civil Service Regulations, which forbid an Assistant Conservator, 1st grade, to draw more than Rs. 550 a month. H has already officiated for some time in the 3rd grade of Deputy Conservators, and is likely to continue to do so, but gets no benefit at all from it, while B has for years drawn Rs. 650 at intervals. Why the 1st grade of Assistant Conservators should be selected for this hardship, particular to themselves, of not being allowed to draw more than Rs. 100 a month more than their substantive pay is a matter which might present itself to the Forest Association. It is true that a similar disability rests on officiating Conservators, but then their immediate rise of pay on officiating is Rs. 300 at least, while the mere fact of becoming a Conservator is likely to prevent a man from grumbling.

To go back to our friends B and H their case shows that however correct your correspondents may be in their facts, they are quite wrong in their deductions even though they may themselves have been unfortunate in promotion. If they consider that B has had his promotion spoiled by transfers from India, I can only say that I should like very much to be transferred to the Province where what they would consider good promotion is obtainable. To show that the superiority of promotion in Burma over some of that in India is not confined to one period, I will quote one more case. In 1896 a certain officer was transferred to Burma from the United Provinces as an Assistant Conservator, 1st grade, with over 8 years service. On the 1st July 1896 he appears in the Burma list as a Deputy Conservator, 3rd grade, a position to which he would not have attained in the United Provinces until the end of 1901. There is a second point in which Messrs. 'Taw Kwe' and Carr are under a misapprehension: they appear to think that the appearance on the list of senior men from other Provinces is peculiar to Burma. I can assure them that less than half the men senior to H have been in the province from the beginning of their service.

Lastly, it is beside the point for 'Taw Kwe' to talk as if the removal or promotion of men senior to him were of no benefit, if those men do not happen to have begun their career in Burma. If H were suddenly to find one of the men above him gone, other than those who began their service in the Province, he would get his promotion at once, but according to 'Taw Kwe' he would have no cause to be thankful. Yet the result would be exactly the same if the man removed were an original officer of the Province. It is worth remark that B has been known to grumble for the same reasons as 'Taw Kwe' and Mr. Carr. H indeed has been singularly unfortunate.

"ANOTHER NON-BURMAN."

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION IN THE LOWER PROVINCES OF BENGAL, 1903-04.

The area of reserved forest in Bengal has undergone an important change during the year under review owing to the final reservation and notification under section 19 of the Forest Act of four forests having an aggregate area of 45,449 acres in the Chittagong District. Two other forests in this Collectorate containing 114 square miles were demarcated, and the Conservator hopes that their reservation will shortly be completed. We believe we are correct in stating that these Chittagong Collectorate forests were notified under section 4 of the Forest Act so long ago as 1893 or 1894. It is more than probable that had not the Khas Tehsildars, who held charge of these forests under the Collector, and were therefore Forest Officers, been also appointed Forest Settlement Officers this otherwise incomprehensible delay would not have taken place. The Report goes on to state that 'so far as is known'—whatever this may mean—'outside of the Chittagong and Buxa Divisions the Provinces contain no considerable tracts of public forest land which could be usefully reserved under the Forest Act.

The only new working plan sanctioned during the year was that of the Puri Reserves, area 110 square miles, but plans for the Singbhum and Kurseong Reserves were in the press at the close of the year, and work had been commenced on a plan for the Buxa forests and upon a rough one for the Palamau Reserves. Work on the revision of the Darjiling, Jalpaiguri, Tista and Sundarbans plans was carried on and completed during the year.

No plans exist or are under preparation for Chittagong, Sonthal Parganas or the Singalila Reserve in the Darjiling Division.

During a tour of inspection in the cold weather the Inspector-General issued detailed recommendations regarding the preparation of the Buxa and Kurseong working plans and the revision of the Jalpaiguri, Sundarbans and Darjiling plans.

Under expenditure on buildings we note that a sum of Rs. 18,000 was spent on purchasing an Old Club House at Chittagong 'for a residence for the Divisional Officer and for the accommodation of his office.' We cannot help expressing dissatisfaction, and we feel sure that many of our readers will agree with us, at this policy, which we had hoped was a thing of the past, of combining an official office with a private residence. The majority of Englishmen in a country like India do not care to have their official staff and all the hangers-on it inevitably entails daily inhabiting a portion of the house which they themselves must occupy. The case becomes even worse when ladies have to be left alone in the said building during lengthened absences in camp. We are glad to note that four substantial rest-houses were built in Puri, Darjiling and Buxa.

Under fire protection there are some interesting remarks on the subject of fire protection in forests bordering upon Native States. In several instances these latter have apparently objected to burning grass areas within their borders, although the non-firing of such has added enormously to the danger to adjacent Government reserves. We note that a satisfactory arrangement has been come to with the Nepal Durbar, and that the Bengal Government hope to have equal success with the States in Chota Nagpur and Orissa.

Under natural regeneration the sal is said to have seeded well in the Tista and Darjiling Divisions, but not elsewhere, and

there was a general flowering of the Preng bamboo (*Arundinaria hookeriana*) in the Tista and Darjiling Divisions and of a small patch of the maling bamboo (*A. racemosa*) in the latter division.

It has, we note, been finally determined that coppice reproduction of sal in the damp Duars climate is of a very feeble description, and the working plan is being revised accordingly. Successful coppice fellings of sal, *Xylia dolabriformis* and of most miscellaneous trees have resulted in the Puri Division.

Under plantations we are glad to note that the Jellapahar cantonment above Darjiling is at last to be planted up by the Department, a departure which has long been required. 97,000 transplants were put out under the working plan prescriptions in the Darjiling Division and 15,000 in the Mal block of the Tista Division.

Experiments with exotics do not appear to be a success in Bengal, but we think that perhaps the Department does not know quite enough as yet about the economic products of the forests to justify the following sweeping remark of the Conservator: "Considerable efforts made in the course of the last ten years to obtain markets for little-known economic products, and for certain well-known products which are comparatively rare in Bengal, have always resulted in failure, and the Department will do well to leave such experiments alone till it is better qualified to deal with them." Take, for instance, the sabai grass of the Singbhum Reserves. We see that the new three years' lease only fetched Rs. 1,10,000 or Rs. 16,000 less than the previous three years' term (the reason for the drop not being given). Still, even this sum is a very great advance on the Rs. 1,500, which is all, we believe, that the lease fetched in the year 1893. The attempts to sell the sabai were at that period practically failures, but luckily for Bengal the Divisional Officers were not content to leave the matter alone, with the result that success was finally achieved.

Under removals by purchasers there is a decrease of 2,463,876 cubic feet under timber and 1,036,331 cubic feet under fuel respectively. The fall under timber is said to be chiefly due to the decrease in removals of sundri due to overworking under the expired

working plan. Chittagong is responsible for a decrease of 210,331 cubic feet of timber and also a decrease in the number of bamboos extracted. In these decreases we see the old excuses of deficient rains and cholera trotted out and again paraded. When we read further on "the steam launch *Helen Gray* was transferred from Chittagong, where she appears to have been of very little use," we come nearer to a more probable reason. The launch was built for Chittagong in order that inspections by the Divisional Officer might be more frequent and, shall we say, unexpected ! It is true that the launch meant that heavy monthly travelling allowance bills were a thing of the past, but this was more than counterbalanced from the point of view of Government by the fact that it was possible for an Inspecting Officer in the launch to visit all the toll stations of importance south of the Karnafuli in five days, whereas 17 to 20 days is the least probable period, without exceptional luck, under the old, now reverted to, row boat (or T. A. mileage) system. Under the new plan, which states that a *sailing* boat is to be tried, the above trip will take probably a month, during which the rest of the division will take care of itself, with the usual heavy drop in revenue that this has always meant in Chittagong. With the new reserves and with constant and energetic inspection of all the toll stations and revenue-making reserves the Chittagong revenue should easily double itself, but this will not be done by means of trips in a sailing boat working down south against perhaps three weeks of contrary winds.

In commenting upon the decrease in the outturn of wood the Conservator fears that it will take some years for this source to recover itself owing to overworking in the Sundarbans and to other accessible areas having been fully worked up to. 'The opening out,' he continues, 'of the more remote forests which should make good the deficiency must be gradual.' We would, we speak without present knowledge, like to know whether the Conservator has turned his attention to the big reserves situated in the Chittagong Hill Tracts ! These areas, almost, we think, from their first formation, have been closed to felling, only the removal of canes and bamboos, &c., having been permitted. Whilst we would not

advocate the throwing open of these areas to promiscuous felling, we believe that the time has come to have a careful inspection made of their contents (this will need the deputation of a special officer, since the forests are too far removed to make it possible for the Divisional Officer to carry on his ordinary duties in addition to this piece of work) with a view to the removal of the large number of over-mature trees which it is probable they contain.

NOTES ON THE COMMERCIAL TIMBERS OF NEW SOUTH WALES.*

From the pen of that admirable and indefatigable botanist, Mr. J. H. Maiden, we have before us the second edition of this small and highly useful illustrated work. In his introductory remarks the author gives the reasons for the appearance of the pamphlet. The object is to give information in regard to the principal commercial timbers of the Colony in language as devoid as possible of scientific technicalities. Only those points are touched upon that are of practical moment to the timber-getter, saw-miller, merchant, or user. "An endeavour has been made to give an impartial statement of the merits of our timbers as we know them at the present day. In course of time some of the estimates of the qualities of particular timbers may require to be modified, and other timbers, not at present employed, may be shown to be useful for special purposes." Having for many years been almost daily occupied in the diagnosis and critical examination of colonial timbers of all kinds, and having been a large user of many kinds of colonial timbers for miscellaneous purposes, and having visited most of the principal forests and saw-mills of the State, Mr. Maiden was in a particularly favourable position to undertake the compilation of such a handbook, and its usefulness cannot be overestimated.

After pointing out that timber is a necessity, the author mentions that the supply of good timbers is not unlimited (and

* Notes on the Commercial Timbers of New South Wales, by J. H. Maiden, F.L.S., Government Botanist and Director of the Botanic Gardens, Sydney, 2nd edition, illustrated. Sydney Government Printer. Price 1s.

this remark does not apply to New South Wales alone) and that cutting requires to be followed by replanting. As regards export Mr. Maiden considers that as the merits of their hardwoods become more fully recognised a largely increased demand may be reasonably expected to set in for them, and on this head he says that too great care cannot be exercised in seeing that timber which is sent to market, and particularly that intended for export, is not only good of its kind, but also belongs to a species of acknowledged merit. In the case of trees or timbers which bear a resemblance more or less strong to valuable timbers, the greatest care should be exercised. We cannot but think that the great backwardness that has dogged the footsteps of the Department in India in this respect has been due to laxity on this score, and a small pamphlet on the subject of our good commercial woods and those inferior ones which closely resemble them, with the differences clearly indicated, would be an incalculable boon to many a Forest Officer. To its absence one cannot but attribute, in part at any rate, the extreme reluctance of the great Departments, such as the Public Works, Military Works, Telegraph, to take any but the few well-known good woods, the woods which have been used from time immemorial by the native himself, without any attempt being made to find out whether there are not a number of others which would serve equally well for many of the purposes for which the more valuable timber is now used. We think that in this respect the European has followed far too blindly in the path trodden by the native of the country. Such works as "Gamble's Manual of Timbers" are far too large for useful and handy service in this respect, and until we have a really handy reference book it is probable that many of our timbers will remain unknown as far as all practical (*i.e.*, economical) purposes are concerned.

Mr. Maiden remarks upon the importance of felling timber at the proper season and on the still greater one of subjecting the cut wood to thorough seasoning processes before exportation, more especially if intended for the foreign market.

In Part II of the pamphlet the author deals with the classification and description of the commercial timbers. His divisions of

this part will explain themselves. They of course deal with the bark or wood of the various trees, leaving out of the question all systematic classificatory considerations. We have a first group termed Iron barks, then Stringy barks, (3) Pale hardwoods, (4) Red hardwoods, (5) Turpentine and Brush-box, (6) Cedar, Beech and Pine, (7) Silky Oak, She-oak, &c., (8) Black bean, Myall, and (9) Miscellaneous Brush Timbers. Under each short descriptions of the wood are given with the uses for which it is recommended, distribution and quantity available.

Part III treats of timbers for special purposes. This practically consists of a list of the principal native timbers classified according to their uses. For instance, under the heading Bee-boxes we find cedar and beech recommended; Boat-building—cedar; Bullock yokes—river oak, swamp oak, &c.; Carriage-building,—Red cedar, rosewood, plumwood, beech, &c.; Carving—white holly, grey myrtle, &c.; Charcoal—Murray red gum, stringy bark; Railway keys—cedar, flindosa or cudgerie; Railway sleepers—iron bark, grey gum, Murray red gum; Walking sticks—(a) whole plant, tea trees, dwarf palms, native cherry, oaks, (b) cut out of solid wood, black wood, tulip, cabbage palm, &c. The value of such a useful condensed hand list cannot be overrated.

A few notes on special uses of timber, such as the wood required for backs of hair-bushes, engraving, &c., the production of such substances as naphtha, wood-spirit and tar, mining timbers, Railway sleepers, wine casks, wood pavement and wood pulp, brings this extremely useful and handy pamphlet of 38 pages to a close. At the end are nine excellent plates showing the stems of some of the chief of the large commercial trees.

We have reviewed this small work at some length because we would draw attention to the inestimable advantage such a handbook would prove to the Indian Forest Officer, and one may include the officers of the Public Works, Military Works, Telegraphs and the great timber merchants of the country. We all require a handbook for use in the forest. Neither "Gamble's Manual of Timbers" nor "Watt's Dictionary of Economic Products" can be used as such.

SHIKAR, TRAVEL AND NATURAL HISTORY NOTES.

OUTBREAK OF A FATAL DISEASE AMONG WILD ANIMALS AND AGRICULTURAL CATTLE IN MYSORE.

Having seen an article entitled 'A New Disease in Coorg' in the *Indian Forester* of October last, I would wish to place upon record the following facts in connection with it which have come to my notice during the last four months :—

The disease was first noticed on a 'Kumki' elephant by name 'Kadampyari,' which was sent to Kymara, a forest station on the frontier line between Malabar and Mysore, for dragging timber in the forest ; the elephant was at Kymara for three days, but did no work, as the forester was not present. It returned to Mastigudi on the 28th May in an apparently healthy condition and dragged timber in the Kardihalla forest for two days. On the morning of 1st June a big swelling like a bubo appeared between the hind legs, which travelled on towards the neck ; the animal gave up its usual leaf fodder, but used to take in small quantities of rice, mixed with jaggery, and little or no water. The mahouts did not know what the disease was, but gave some highly stimulating medicines and also externally applied an ointment prepared of 'ragi' and a jungle root. The animal was brought to Kakankote from Mastigudi, a distance of one mile, on the first day of its illness ; for three days it was ailing from this disease, falling down and getting up repeatedly, probably owing to colic, and experienced difficulty in breathing. In spite of all the medicines and treatment afforded, the animal grew worse day by day, and succumbed to the disease on the 7th idem. Instantly a big pit was dug, the carcase was dragged to the pit by other Kumkis, burnt and buried.

About the same time a petty merchant, who had gone to Malabar, returned from Vonteangadi, a Malabar village, *via* Kymara and Sunkadkatte, with four bullocks. He lost one of his bullocks

on the road, another in his village Oyyamballi from apparently the same disease as above, and the infection spread from these into the surrounding villages around Antersante, with the result that fifty cattle died in thirteen villages in all, only seven attacked animals recovering.

I heard from the Malabar Range Officer that one of the timber-dragging elephants named 'Phyllis' was attacked in Begur, a forest station seven miles from Vonteangadi, and that all the other elephants were segregated at once; the whole buba was cut away and medicine applied, and it recovered. Many cattle in and around Vonteangadi had also succumbed to the disease.

These instances prove that the disease spread from Malabar into this part of the Mysore district.

To show the further progress of the disease towards Kakankote, 'Wasp,' a well-known shikari elephant, caught the infection on the 10th; the swollen part was branded, and the animal seemed to improve, but grew worse on the 11th, and died on the 12th. The other Kumkies, *viz.*, 'Ganesh' and 'Jang Bahadur,' were segregated at once from the diseased elephant; they had, however, caught the infection, but managed to go to Karapur, a distance of six miles. Ganesh could go no further, but Jang Bahadur, continuing its journey, reached Munchagowdanhally. The former exhibited the swelling, which increased and showed the same symptoms as those of Kadampyari, and the elephant died on the 18th in spite of all the treatment afforded. Jang Bahadur had swellings all over the body, and these began to open out after the application of an ointment. The animal recovered.

The disease now spread into the jungles, with the result that six wild elephants, five male and one female, eight bison, fourteen deer, and three sambar were found dead in different parts of the forest.

The matter was reported to Government, and the Government Bacteriologist and Veterinary officers were requested to diagnose the disease. They came to Kakankote, and had two elephants exhumed, but the process of decomposition was so far advanced that nothing could be made out of them. At Antersante the blood of Jang

Bahadur, who was recovering, was examined, and it was found to contain bacilli which the Bacteriologist thought were a variety of *Bacillus septicæmia hæmorrhagica*. He says that a similar epidemic was observed among deer and cattle in 1894 in parts of Germany, but the only new feature is the attack of elephants. The measures he recommends are the isolation of the infected animals, the prevention of the healthy ones from gaining access to the contaminated places, and the burning of the carcasses wherever practicable, or deep burial, so that the surface soil may not become infected.

CAMP METIKUPPE:
16th October 1904.

L. P. MASCARENHAS,
Forest Ranger, Kakankote.

EXTRACTS FROM OFFICIAL PAPERS.

THE TREATMENT OF *HARDWICKIA BINATA*.*

Copy of Letter No. 554, dated the 1st December 1903, from E. D. M. Hooper, Esq., Conservator of Forests, Central Circle, Madras Presidency, to the Conservator of Forests, Berar Circle, C. P.

I have the honour to forward the following remarks on the subject of *Hardwickia binata*:—

My first acquaintance with *Hardwickia binata* was in the Ahiri Zamindari and Godavari Taluks of the Chanda district of the Central Provinces, and subsequently I have studied it in the Godavari, Kistna, Kurnool, Bellary, Anantapur, Cudappah, Nellore and Salem districts, that is to say, in the Deccan and on the lower slopes of the Mysore plateau.

In the Ahiri Zamindari to the south of the Bhimaram reserve it was found in 1881 over a restricted area—a pure forest, the stems being strangely uniform, varying in girth from 5 to 6 feet and in height from 40 to 60 feet with clear straight bole. The soil was a quartzose red gravel, crunching under foot, and

* Communicated by E. E. Fernandez, Esq., late Conservator of Forests, Berar Circle.

I have generally observed that wherever *Hardwickia* is very prevalent, this soil occurs. Except in this locality I have seen large trees only where special protection has been constant, as at Sandur, Bellary district, in the Raja's garden; again in a forest near Kudligi and in the Bellary Civil Station. In the first case the tree with a large gnarled trunk 15 feet in girth was an object of worship; the second tree was within a temple compound wall and rose to a height of from 30 to 40 feet with a girth of $3\frac{1}{2}$ feet; and the last was in a private compound about 25 feet with a clean bole, the girth at breast height being about 4 feet. I was unable to discover the age of these trees, but I imagine the tree in Bellary to be not more than 40 years old.

Elsewhere I have not found living specimens of large *Hardwickia*, even in the depths of the Nallamalai Hills of the Kurnool district, but the species is found growing to 40 feet with a diameter of 1 foot on their western base in the Cumbrun Valley on the left of this range, and in the villages there are logs of large size, attesting the existence of large trees in the past. It may also be mentioned that the cantonment bungalows built between 1845 and 1850 on the Ramandrug Hill Station in Bellary have *Hardwickia* beams. Throughout the Deccan the species is generally represented by pollarded stumps varying in girth from 2 feet to 10 feet. Where straight seedling stems are found, they are seldom taller than 20 feet with a girth of 2 feet. I imagine that this species has suffered exceptionally with the progress of civilisation and extension of cultivation during the last fifty years, for these causes have brought about, first, a demand for the wood of the mature trees, then, for the young pollard stems which yield a fibre in constant demand for rope-making and a fuel of value in iron-smelting and charcoal-making, while the leaves and young shoots are eaten by goats and horned cattle.

Next to the tamarind and nim (*Melia*) *Hardwickia* is probably the most useful tree in the Madras Deccan, and it is undoubtedly in danger of disappearing where found in the comparatively woodless areas of the Deccan, and this I consider due to the varied uses it is put to when still young; to its requiring

perhaps more protection than other species and to its gregarious habit.

As regards its distribution we find it occupying clearly defined areas on the rocky quartz soils of Bellary and Anantapur and the sandstone and shales of the Palnad in Kistna. In both localities the rainfall is small and uncertain. The young seedlings appear in profusion, and though they dry off, not only because of fires but apparently from the excessive heat of the dry season, they reassert themselves year after year until the root system is sufficiently vigorous to produce stems strong enough to withstand the heat of the atmosphere and even the passage of fires, though these latter find little to feed on in the way of herbaceous undergrowth or grass in the neighbourhood of *Hardwickia* seedlings because of the hard, gritty, poor soil the species selects. From this drying down in its early life arises the shrubby habit of the young plants which is so generally observed; but after a time one stem asserts itself as in the case of *Acacia arabica* and the others disappear. Occasionally from favourable circumstances a patch of young seedlings from its earliest life grows without hindrance, and I have seen a plant grown by Colonel Doveton in prepared soil at Nagpur on the trap ridge which in one season (1880) was over 5 feet in height. The natural growth of the young tree in the dry Deccan is undoubtedly very slow, and I have watched the species in the Malpangudi and Sherbi reserves of Bellary for the past twenty 20 years and the stems have scarcely progressed.

It would appear therefore that where found naturally in this region its growth is not encouraging, and it is difficult to account for the trees which gave us the timber used in the last century except by supposing that they grew slowly in a country where little was asked of them in their youth, and in their maturity were protected from felling by the excessive hardness of the wood.

Such are the facts which I would put forward in connection with this species, and my experience certainly coincides with yours and others in showing that the species is slow to establish itself except where the soil is easily penetrable by its roots.

EXTRACT FROM BERAR ANNUAL FOREST ADMINISTRATION REPORT
FOR 1903-04.

§ 46. *Anjan* (*Hardwickia binata*) reproduction and grazing.—As every forester knows who has had anything to do with the anjan, it is a tree of a remarkably gregarious habit, and yet—and that is a very important *yet*—recent reproduction of it in our strictly conserved forests is conspicuous by its absence. The idea of the writer, who first began to study this tree nearly thirty-one years ago and whose views are detailed in the *Indian Forester* for November 1903, is that the existing stock is the result of unrestricted grazing and, over large areas, also of nomadic cultivation in the past. The soil which it loves is, as a rule, suited only for short periods of cultivation followed by long intervals of fallow. Since the stoppage of grazing and that primitive system of cultivation, the conditions necessary for its reproduction by seed no longer exist. In this connection the following extract from Mr. Martin's report will be read with interest :—

The anjan seeded very fairly profusely in the spring of 1902, and the seed germinated freely during the following monsoon along the Ajanta Hills, especially in the Gern-Matargaon Range around Botha and Matargaon. A very noticeable feature was the complete absence of seedlings from the midst of dense grass, that is, from areas entirely closed to grazing. They appeared wherever the grass was light and increased in numbers with decrease in density of the grass, till over areas free of grass the seedlings were quite dense.

The above was most noticeable round Matargaon. There in one and the same ravine the climatic factors are presumably everywhere identical, and the fertility of the soil can hardly vary much over localities only a mile apart (at any rate, they appear to me to be similar). In the portions of the reserve closed to grazing, and consequently covered with a dense crop of grass, anjan seedlings were completely absent, except just along road-sides, whereas in Survey Nos. 1, 2, 3 and 6 of Chinchkhel, which were open to *heavy* grazing and, being situated close to a public road, were much resorted to by cattle, and as a result absolutely clean grazed, thousands of seedlings have sprung up and stand out *uninjured* and perfectly healthy. The above appears to prove conclusively that a dense growth of grass is inimical to the successful reproduction of anjan. The seedlings observed in those Survey numbers having survived, the past two hot weathers and escaped injury from cattle during the same period, when in the absence of other fodder cattle might have been expected to browse them off, grazing *throughout the year* must obviously be looked upon as a distinct advantage, in fact a real necessity.

§ 66. *Experiments for determining the best method to follow in adopting pollarding as a system of treatment for Anjan.*—In the

event of our failing to discover within a reasonable time how to effect the natural regeneration of anjan by seed, it behoves us to set about beforehand, in order to be at once prepared, with some such system as will enable us at length to begin to work our anjan forests. It is not creditable to the Department, after nearly 40 years of existence, to be able to give no better answer than a *non possumus* when asked to start the exploitation of these forests on a scientific basis. Accordingly, an area of four acres has been marked out in the Buldana Division where the necessary experiments have been set on foot. It is too early as yet to describe them.

MISCELLANEA.

THE RAVAGES OF SHIP-WORMS ON AUSTRALIAN HARDWOODS.

JARRAH VS. TURPENTINE.

(From "*Indian Engineering*.")

With the object of ascertaining the degree of immunity from the attacks of *Nausitoria*, commonly called *Teredo*, and other ship-worms, possessed by the well-known jarrah timber of Western Australia (*Eucalyptus marginata*), a pile of 4 feet 3 inches circumference was sent by the Government of that State to New South Wales, with a request that it should be subjected to a severe test. For the purpose of comparison it was thought desirable to test the resisting qualities of the New South Wales Turpentine (*Syncarpia laurifolia*) at the same time, so a pile 3 feet 6 inches in circumference was selected for the experiment.

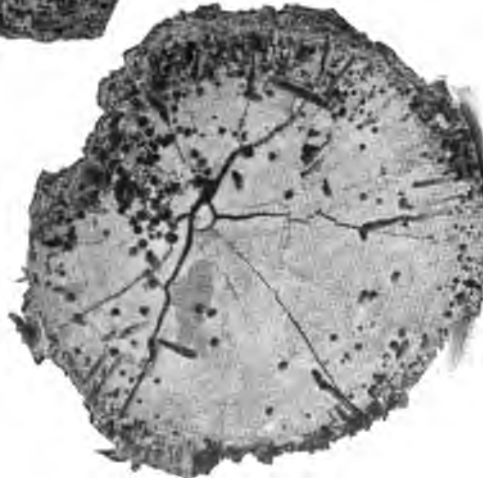
In August 1897 both piles were driven, in about 10 feet of water, in the North Harbour of Port Hunter, about 2 miles from the entrance. The range of tides at this spot is about 5½ feet at springs, and 3½ feet at neap tides, the water being quite salt, except when freshes occur; it is then more or less brackish for a few days, but never fresh sufficiently long to interfere with



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No. 3.

The Ravages of Ship-worms on Australian Hard-woods.

the health of the ship-worms. The greatest tidal velocity is from 1 to $1\frac{1}{2}$ knots, and the velocity due to flood waters possibly 2 knots.

In February of this year (1904), or six and a half years after driving, the two piles were drawn, and sections cut between high and low water marks. The photograph attached shows clearly the result of the test. In the Turpentine pile the ravages of the *Nausitoria* are confined almost entirely to about an inch of the sapwood, the remainder of the pile being as sound as on the day it was driven. The jarrah, on the contrary, is completely riddled between high and low water marks, the tunnels of the worm having a longitudinal, transverse, or diagonal direction, quite irrespective of the hardness or grain of the timber.

For some reason which is, at present, not quite clear, the northern side of the pile, or the side on which the ebb tide impinges, appears to have been preferred by the *Nausitoria*.

Below low water mark both piles were practically sound, and beneath the ground-line they were in a perfect state of preservation.

It cannot of course be claimed that this one test is conclusive, for unfortunately records do not appear to have been kept of the locality in which each tree was grown, the age of the tree, the time of year in which it was cut down, or the time that elapsed between the felling of the tree and the driving of the pile. Each of these items has an important bearing upon the life of the pile, and, possibly, upon its capability of resisting the attacks of ship-worms.

It can, however, be said that the present experiment proves that the jarrah is not immune from the *Nausitoria* under all circumstances, but that the Turpentine has here added another to the long list of proofs that it is impregnable under almost all conditions to attacks of ship-worms or marine borers.

J. DAVIS, M. INST. C. E.,
Under-Secretary for Public Works,
New South Wales.

NEW WOODS.

Under this heading the *Timber Trade Journal* has a series of interesting articles of which we reproduce the first here :—

In our issue of the 24th ultimo we reported the meeting held in Liverpool under the auspices of the Chamber of Commerce of that city, and Mr. Thompson is to be congratulated on the steps he took in endeavouring to bring before the timber trade the potentialities of the resources of Southern Nigeria. It will no doubt surprise many to learn that the volume of the Liverpool mahogany trade is from four to five times greater than it was about twelve years ago. The question naturally arises to what extent can the trade continue to expand, and in what direction can that expansion be guided and stimulated ?

Thanks to the excellent service of steamers between the West Coast of Africa and Liverpool, the latter is, and must of necessity continue to be, the great clearing house for mahogany for all parts of Europe and for the States and Canada. It would, however, be superfluous on our part to explain all the causes which have brought about this result ; but, at the same time, whilst it is gratifying to learn that a freight rate of 25s. is fixed for shipments from the Niger River, we think that lower rates than 35s. (and upwards) from other ports might with advantage be adopted. If the African mahogany trade is to continue, those who face the risks of climate and the anxiety as to the results must at least see a living profit at the end of it.

It must be apparent to all that the present average of auction prices do not bring out actual expenses, and we cannot but think that there is room for competition amongst steamship owners for this class of freight, and unless the present line of steamers faces the position, there is sure to arise in the near future a smart competition for the traffic.

At the same time, we feel bound to admit that, unsatisfactory as the results to the shippers are, very much of the fault lies with themselves, in the careless and haphazard manner in which they send forward the wood, much of which is absolutely unmerchantable, and which ought not to be shipped, at least without careful manipulation.

We have previously advocated the desirability of the African merchants securing from Belize some experienced loggers ; if not, to get out the wood they might with advantage superintend its shipment, either by not allowing such grossly inferior logs to incur freight, or by judiciously cross-cutting and trimming them, so that they will not only be saleable at reasonable prices, but that in addition they will cost less in freight by reason of their reduced weight.

Another factor which the shippers overlook is that mere size in itself does not constitute value. A buyer must of necessity determine to what purpose he can apply a log, and on this he bases the price he can afford. In wood, as in everything else, the conditions of requirements vary, and in this connection there is only a strictly limited demand for large countertops, even, if really prime ; this arises from the present fashion of air-tight glass show-cases, &c.

Another cause which prevents large logs commanding their otherwise intrinsic value is the small number of saw mills which can convert them, and pit sawyers are almost defunct ; now and then logs of extreme length and depth are required, regardless of cost. At present the market is altogether overdone with them, but there is an unlimitable demand for medium to moderately large sizes, say, 30 inches to 36 inches. In many cases it would be an advantage for logs 30 feet to 40 feet to be cross-cut before shipment, so as to bring them within the lower scale of freight rates.

Another depressing influence upon the value of African mahogany is that it is extremely varying in colour and texture. Possibly these remarks do not apply with any great force in the Lagos and Benin shipments, but there is room for much improvement in many of the others.

It is, of course, a moot point how far expert loggers could introduce a system of classification (and marks) of logs, according to their evenness of colour and texture, but in large constructive undertakings it is desirable to be able to secure a large quantity of logs which contain in a great degree these essential factors.

the whole economic argument of mahogany. It is not, as we have said, a question of the price at which they can be sold, whether they will find the market or a market. It is essentially mahogany that is sold via a few of the big firms at the same time, to pass on their own business of not regarding the fact that *Swietenia* wood has grown rare under the present conditions of the industry, as a business value, and any business depending on mahogany is a very poor business, and that it can only be a long waiting for the economic conditions. It is with considerable difference that we have the same situation. Speaking of the mahogany of the world, if they reduce the price of the mahogany of the 26 months ago. In some countries there has been a great deal of mahogany, and more than the mahogany of the mahogany, which latter is mahogany, a variety of *Swietenia*.

Swietenia is the mahogany wood, which is mahogany, it has found today a very low commercial value and so long as the true mahogany is not taken as to prevent current prices, shippers of mahogany will not sell it, but if they only send it forward in very small quantities, for reasons which we will see later it is quite possible that at some future time it may prove to be a valuable wood.

Coming then to the possible development of the African timber trade, the mahogany belt there comprises an enormous territory, the extent of which is as yet undetermined, against which the mahogany districts of Central America become a mere speck on the map: is it realized that the area of British Honduras does not exceed that of Wales?

Since the first introduction of mahogany into England no wood has been found to compare with it, notwithstanding that the world has been exploited. We well remember some 30 to 35 years ago, when the fashions in furniture changed, how for a while mahogany was discarded in favour of black walnut, the supply of which is now all but exhausted, especially where size and quality are requisite in large constructive undertakings, so that to-day it is no factor in the market. The supply of teak is extremely

limited, and its enhanced cost is making its use prohibitive. We may at this juncture point out that the European wainscot oak and quartered oak from the States are not only costly but more difficult to season and to work ; the supply, especially of the latter, in good qualities is limited ; hence the necessity for the Americans, with their high plane of living, the furnishing of their houses and hotels, to say nothing of the equipment of the rolling stock of their railroads, to seek foreign high-class furniture woods ; at the present day not only are they practically absorbing the Central American supplies, but they are large buyers in Liverpool of mahogany from Africa, a condition of affairs which time will accentuate and tend to a greater demand than has been known in the past.

In this consideration it is impossible to ignore the fact of the high prices commanded by Canadian pine and the American canary wood, each of which enters so largely into the construction of furniture and other internal fittings.

Quebec ash has become more costly, coupled with the ever-increasing difficulty as to quality and colour, so that its meridian is passed. The so-called satin walnut can never be reckoned as a high-class furniture wood.

The consideration of these conditions, affecting as they do the cost of the article produced, and—what is also equally important—the question of the quantity available, all tend to the favourable expansion in the demand for mahogany.

Mahogany, in addition by its abundance and lowness of cost, has the following characteristics, namely, that it is not difficult to season or to work, and when wrought it will stand ; as a wood for painting it is second to none ; it is also capable of taking a fine polish ; and last, but not the least, when manufactured, its beauty of colour and appearance at once rank it as a premier wood.

Whilst conceding all these points in favour of mahogany shippers must not imagine that it has any monopoly ; we are willing to grant that they should live by their product, but as surely as the price gets beyond a certain point, so soon will •

substitutes be sought and found. We have endeavoured to show that the development of the mahogany trade has not been made by an advance in prices, but rather by the cheapening of cost has its popularity grown, thereby supplanting other woods, the prices of which have advanced. So that if shippers of mahogany would maintain its supremacy, they should seek their profit, not in high prices (although really fine figured logs will always command good results), but rather to reduce their costs, either by introducing (wherever possible) mechanical methods in haulage, economy in conversion, and so to manipulate the logs that they will command their highest possible value; to ensure this it is necessary to avoid shipping "deadheads," and to cross-cut the faulty ends off many logs which would otherwise be valuable, but are simply ruined by the reckless manner in which they are spiked for snigging purposes.

Whilst it is impossible to lay down absolute rules, it is generally safe to say the spikes, if used at all, should be driven as near the end as practicable, on the hollow side, or on that opposite the snape, otherwise the best wood is frequently ruined, thereby depreciating value.

The importance of mahogany in our commercial economy justifies the length of our observations, which, by the way, apply with equal force to the handling of other furniture woods; we must, however, hold over for our next issue the consideration of how and under what circumstances strange woods may find a profitable introduction into our commercial economy.

FORESTRY AT THE WORLD'S FAIR.

The great World's Fair at St. Louis affords an opportunity to measure the real progress that forestry has made in the United States within a decade. At the Chicago Fair, in 1893, a comparatively small building served to exhibit the country's forest interests and their relation to other subjects. The building devoted to the two Departments of Forestry and Fish and Game at St. Louis covers 41 acres, and about 4 acres more are given to outdoor exhibits and demonstrations.

But too much is said of size at St. Louis. Quality does not always keep pace with it. This, however, is probably less true of the Forestry Department than of several others.

It is an old idea that forestry and game culture go together, and therefore not unnatural to find the two combined at the Fair. There is an advantage in it in that the animals, live or mounted, serve as attractions to many people, who incidentally get some knowledge of the forestry side; yet one wishes that irrigation and the interests of the farmers could be substituted for those of the hunters. The latter are often not hunters at all but city people whose ideas of forests and forestry are chiefly of the sentimental or irresponsible kind. The hope of forestry rests more in enlisting the active interest of country people than in the enthusiasm of city dwellers. The concentration of effort that is possible in populous centres supplies a great initial force, but unless the movement reaches those who are directly concerned, there is no real result.

Inside and around the Forestry, Fish and Game building are many interesting exhibits of animals—live, stuffed, or painted. Aquaria in the Missouri, Pennsylvania, and New Jersey sections show many kinds of fishes in salt and fresh water. Yet these things must be passed over; the visitor will be sure to see what he wants of them, for in many cases they are shown side by side with what more particularly belongs to forestry.

With some exceptions, the exhibits are made by States, the national and foreign Governments or by Associations. Few individual exhibitors appear, unless it be as participators in State displays. This, of course, is regrettable, in that it limits the variety of products and processes that may be seen; it is a distinct advantage in lessening the purely commercial aspect of the show.

Some of the exhibits most worthy of note are the following:—

EXHIBITS BY FOREIGN COUNTRIES.

Germany.—In a pavilion, whose central space is occupied by a life-size bust of Emperor William in hunting costume, are shown, by means of pictures, maps, models, and tools, the technical side of forestry. The maps are copies of those used by the Forest Officers. The pictures show the character of the forests, and the labels on

them explain what the management seeks and what it has attained. A model of a broadleaf forest, with trees about 15 inches tall and ingeniously constructed of twigs and sponges, demonstrates the philosophy of thinnings. Various statistical charts also are interesting and the library of forest books. This exhibit is especially of Prussian forests, their problems and practices, and of the two Prussian Forest Schools, Eberswalde and Münden. It is the only distinctly technical exhibit made and is in every way worthy of careful study. The uniformed forester in charge speaks English and likes to answer questions.

Japan.—As in every department of the Fair, the New World Power has an extensive exhibit in the forestry building, though a large part of it is devoted to its fisheries. That the country is keenly alive to the need of looking after its forests is shown by a carefully prepared series of forest maps and a number of charts, all on German models, giving graphic information concerning the area, value, yield, etc., of the forest interests of the nation. A large number of fine specimens of commercial woods is also shown; each is carefully labelled with the scientific as well as the local names. In going over these samples one is struck with the considerable number of clear, soft, easy-working woods. If Japan were prepared to export these, she would have no difficulty in finding a market for them, but it is said that the available quantity of none is great. Perhaps the most interesting feature of the whole exhibit is a collection of bamboos—clear, straight, beautiful specimens—from the little knotty ones that are used for switch canes to poles 6 inches in diameter and 40 feet long.

France—makes only a small forestry exhibit; there are some fine specimens of cabinet woods, none of them native, and an interesting demonstration of quarter sawing on several sections of oak logs, but nothing of the French sylviculture or forest management that one would like to see. A model of a city building with pole scaffolding, such as is universally used in Europe, presents a striking contrast between their and our ways of using wood. Such a scaffolding, the pieces all lashed, not nailed, together so that it can be taken down, may serve to put up a hundred buildings. A

separate exhibit in the French section shows a fine collection of willow basket ware. It would be interesting to see more of this work, since an effort is now making to extend the industry in this country ; but, so far as I know, this exhibit is the only one at the Fair.

Great Britain—exhibits no forestry to speak of. A few photographs are interesting in showing the kind of timber that is esteemed there, and we who insist on clear, straight, white oak may learn something from the taste of the English that will profit our forests.

Canada.—The great rustic arch, which forms the chief feature of the Canadian exhibit is an attractive piece of work ; yet one wonders what it is for. The legend that it bears in letters of gold—over three thousand varieties of wood used in this rustic work all grown in Canada—is false of course, and the statement is but little bettered when it is explained that most of the pieces are from fruit tree stock, every nurseryman's variety counting one. The exhibit is really valuable in giving information relative to the Dominion's forest industries, the location and character of its timber lands, etc. These are set forth on placards and in an attractive booklet. In a separate building near by are shown some fine specimens of Canadian logs and lumber, and the only exhibit of pulp wood at the Fair. The Canadian species, of course, are the same as those found in our Northern States.

Other Foreign Countries.—Mexico, Brazil, Venezuela, Argentina, Cuba, and some other countries make exhibits of woods, and sometimes of herbarium specimens, that are interesting botanically; yet, since no one goes to a Fair to study such things, their value is not apparent. It is well known that few tropical woods are commercially important, because they are unworkable or too widely scattered ; consequently most of the specimens might as well have been left at home. One likes to see *Quebracho colorado*, the Argentina wood that is so rich in tannin, and to recognise in the really great Brazilian collection some of the more familiar cabinet woods, but it is impossible to go into details. The Portuguese exhibit of cork would be more interesting if it showed even a little

of the methods employed in handling the cork bark. As it stands it is out of place in the forestry building, being purely a manufacturer's exhibit. —A. GASKILL in *Forestry and Irrigation*.

MONORAIL TRAMWAYS IN MADRAS.—Rao Sahib T. Namburnal Chetty, the well-known contractor of Madras, has, in addition to the tramway concessions he already holds, applied to the Government of Madras, with the consent of the District Board of Chingleput, for powers to construct, maintain and use the following Ewing's monorail tramways in the District of Chingleput: From Poonamalee to St. Thomas's Mount $7\frac{1}{2}$ miles, to connect the two lines already sanctioned by the Government of Madras; and a line from the Municipal laterite quarries at the Red Hills along the Erukkenjeri Road to the Municipal toll-bar on that road $7\frac{1}{2}$ miles.

THE EFFECT OF VIOLENT WIND ON THE LEAVES OF TREES.—'Godavari' writes to us as follows: "The 15th of October 1904 witnessed a cyclone of the most terrific and disastrous nature. It began to blow a gale at 2 p. m., the wind increased in force at about 3 p. m., and blew with great violence, blasting everything before it in a most terrible manner, even snapping off the tops of cocoanut and palmyra trees with the greatest ease. The sea got up, and the danger of a bore or tidal wave, similar to the one which forty years ago submerged the whole town of Masula or Bander, was seriously apprehended. It was fortunately low tide, or the disaster would surely have followed. The writer was the occupant of a frail cockle shell of a boat, anchored not far from the mouth of one of the arms of the Godavari, keeping vigil all night in company with four timid natives, who slunk into the utmost recesses of the boat. It was a night to be remembered and one which one would scarce wish to pass through again. At length came the lull in the storm, and we were enabled to tranquilly estimate the damage done. The Casuarina plantations at B. present a deplorable state of things. Most of the larger trees have been broken off 6 to 10 feet high and the few that managed to stand have been stripped of their leaves and branches, looking like bamboo clumps on which a herd of

elephants have fed. The smaller trees, although more exposed to the direct influence of the storm, have been less unfortunate. The effect of a violent wind on the leaves of broad-leaved species of trees, with the exception of *Casuarina*, is most striking. They appear to have been actually scorched as by a fire. The wind, the natives tell me, was really a hot wind, in spite of a constant drizzle all night. The leaves have been virtually deprived of all their moisture by the continued violence of the wind. Will any of your readers kindly give me a scientific explanation of this scorching?

CINNAMON CULTIVATION IN ASSAM.—An interesting commercial crop reported from the Naga Hills in Assam is that of the wild cinnamon. Specimens of the bark sent to Calcutta have been valued at Rs. 7 per maund. They were somewhat thick, and it has been reported that bark of half the thickness would fetch three times as much. A Calcutta firm is said to have addressed the authorities as to exploiting the product.

SATINWOOD SLEEPERS.—The Ceylon Forest Department took the contract to provide the Northern Railway Extension with sleepers. According to a special report the satinwood sleepers cost Rs. 8 each, while ordinary jarrah sleepers only cost Rs. 4; but the satinwood is expected to last three times as long as the ordinary jarrah.

OSPREY FARMING.—In drawing attention to an account of the way in which osprey farming might be made a lucrative and legitimate pursuit without any of the cruelties that at present attend the production of these feathers in the market, the *Sind Gazette* says: "The question has a special interest for Sindhis. We have often drawn attention to the circumstances under which the osprey plumes are obtained in Sind. In some of the villages the unfortunate egrets are caught and blinded to keep them from escaping. If any of our enlightened Sindhis will take the matter up and start a farm on the lines suggested, they might make a very good thing out of it, and by their example they could induce the ignorant villagers to abandon their present cruel and primitive methods in favour of a procedure more in accordance with the dictates of humanity.







Photo, A. B. Jackson.

Teak Plantation about 50 years old, Nilumbur.



VOLUME XXXI

NUMBER 3

INDIAN FORESTER

MARCH, 1905.

THE STUDY OF INDIAN NATURAL HISTORY.

OUR readers will have read with the greatest interest, perhaps in some cases not unmixed with a little indignation, Mr. Gamble's letters on "Certain Important Forest Questions." It is not our purpose here to enter into a detailed criticism of the views set forth, since they will doubtless call forth the emendation or condemnation which, according to the experience of the critic may appear to him to be their due. There is a point mentioned in the second letter, however, which we are extremely glad to see brought into prominence by a man of the recognised scientific attainments possessed by Mr. Gamble, even though we are unable to accept his deductions as being at all fair to the service which he himself has helped to shed a lustre upon.

The point in question is his allusion to the duty, for we think it cannot be justly called by any other name, which falls within the sphere of Forest Officers (we would rather say of the Forest Department) of adding to the total of our knowledge of the science of Natural History in India. In the article published last month we read—

"And here I should like to point out what a magnificent field the more out of the way forests of India still offer to those who can add something, however small, to the sum of our knowledge of Indian Natural History; for nobody in India has such facilities for doing it as Forest Officers have. The Forest Department has already a considerable roll of fame, both in botany and zoology; but India as yet is only imperfectly explored, and though I know that several Forest Officers are at present doing a great deal, I think there must be others who can help as well in camp, without

very great interference with other duties. It is a common and very true saying that every forester is a student all his life; that to those who observe new ideas come every day, and observation of the natural objects of the forests is surely a part, and a very important part, of the study, and may also help to relieve the tedium of many a long and often otherwise uninteresting march. My idea of what the Forest Department should be in India is perhaps Utopian, but it is at any rate a high one. Except the Geological and Botanical Surveys, which are quite small and special, it is the only Government agency in India which has to deal with natural history, and I have in my mind the Forest Department as the pioneer of scientific work."

We may preface our remarks by saying that we agree with Mr. Gamble in every line of the above extract, but we do not agree with the spirit in which the words were penned, nor can we believe that, were he even remotely acquainted with what the work of a divisional officer in charge of a big division is now-a-days, they would ever have been written. The paragraph is intended to point his argument that although botany was well taught at Cooper's Hill it was doubtful (to him) "whether it has always been quite the right sort of botany that is wanted for our purpose," and further "although Professor Marshall Ward is one of the highest authorities on fungoid diseases of trees and must have taught about them to some extent, but one of his old pupils, so far as I know, has yet attempted to pursue the subject in India, and yet it is a subject of quite as much importance as is that of noxious insects." Perhaps Mr. Gamble is not quite in a position to make this latter statement, but we may let that pass. We will admit that he is quite correct in both his contentions. The subject *was* taught by Professor Marshall Ward, and it *is* an extremely important one, but can he really consider that he is fair in attributing blame to the Department as a whole, and to one set of Forest Officers in particular, to wit Marshall Ward's old students, when he animadverts to the fact that these latter have not become specialists in fungoid tree diseases. Has Mr. Gamble consulted a list of Forest Officers and endeavoured to make himself acquainted

with the extent of the charges held by the majority of the Professor's old pupils, and does he realize what the administrative and professional duties of these divisions now entail? What is the daily life during the camping season some seven months in the year) such a charge necessitates? Between 4—6 hours of hard physical and mental strain in the jungle followed by several hours office work on return to the rest-house or tent, and this day after day, week in and week out, with scarce the remembrance that there is such a thing as a seventh day, the day of rest in the week. We do not write this in any grumbling spirit. The work is intensely interesting and becomes absorbing, but scant time does it allow for dabbling, even fitfully, and therefore unprofitably, in a subject which particularly requires the knowledge of the specialist; those rare exceptions where a superabundant energy happens to be combined with a very sound constitution, enabling the day's work to be extended beyond the length nature has ordained, may well be left out of consideration in the present article. But whilst we think that our criticiser's strictures are, considering the heavy charges and the present undermanned state of the Department, unfair, not to say ludicrous, we welcome the note that has been struck, since it coincides with a doctrine which we have been striving, all to inadequately, to inculcate. We do not consider Mr. Gamble's ideas on the subject of the scientific research work the Department should do and the scientific position it should hold in the least degree Utopian. We would go further and say that we hope to see the service something more than a pioneer in scientific work; we hope to see it in the foremost place amongst the well-established leaders of such work, and our hopes are all the stronger in that it is becoming daily increasingly evident that such work will prove of the greatest use economically to the Department. Work done by the scientist, or specialist as he should more properly be designated, in such a service as the forests means economic progress and research, both of which spell, as the world now-a-days is fully aware, a steady increase in the financial prosperity of commercial concerns. But this cannot be brought about under existing conditions nor by the ineffective dabbings of already

to be employed as executive officers. The days when the two could be separated by distance are gone never to return.

The allusion and evidence for a moment being is that Germany, that France and, finally, that latest recruit, America, have done and are doing so much to bring up to date and to augment knowledge of the scientific natural history, or what is of more importance, since the former must naturally precede the latter, the economic natural history of their several countries. We wonder and has this been done by the men who are responsible for the carrying out of the executive duties which have to be got through and kept up to date? We think Mr. Gamble will agree with us that it has not. In all commercial concerns which come to the front in these days of competition, in all Government Departments in which the management and work have been brought into line with present day requirements, it is the inclusion of the specialist to assist the executive staff that has enabled this to become possible. If we glance through the Continental Services and schools of Forestry we find the specialist at work assisting the executive officer in all questions concerning botany, zoology, chemistry; we see, as has been shown in a previous article, promising students in the Schools assisted and encouraged to go through additional courses in the subject in which they have shown a special aptitude; the idea being that the special knowledge so acquired will enable them to prove of greater use to their several Governments when they finally join the Service.

Can Mr. Gamble furnish us with the name of any of Professor Marshall Ward's students who were given such special advantages whilst at College. We could give him the names of several men who would have followed such a course gladly and would have doubtless done excellent work in India as a result of it, given the opportunities their more lucky confrères on the Continent obtain.

The allusion to the magnificent field offered by out-of-the-way forests for adding to our knowledge of natural history is doubtless intended in a botanical sense. Zoologically speaking the remark equally applies to the most accessible wooded or even unwooded areas of the country. Although almost incredible, it is a fact that

there has been scarcely a scientific Zoological expedition of any note to India as a whole since the British came to the country. Remote inaccessible spots have been visited and their fauna collected, but India has been left severely alone. The consequence is that, with the exception of a few groups, the smaller forms of zoological life are almost unknown, and amongst them those appertaining to the forests hold a very large place. Can the Forest Officer be blamed? The major portion of the little that is known is due to him, collected whilst engaged in his ordinary executive work; but this is not the way to make true progress either zoologically, botanically or chemically. To really advance the specialist is required in all these subjects.

We have alluded to the training of the recruits of the Department. We are now standing upon the threshold of a new departure, and we would suggest that, if it is found at all feasible, some of the great facilities for research work within the reach of the German, the Russian, the American, etc., forest student should be placed within that of the recruits for the controlling staff of the Indian Service. Further, that promising students should be encouraged by being allowed to spend an additional year or two on deputation at Home with a view to their going through extra courses in subjects which are known to be of the highest economic importance in India. We venture to predict that should such a course commend itself to the authorities, not only will the stigma which Mr. Gamble attaches, we think unwarrantably, to the Department be removed but our knowledge of the natural history of India, and of the Indian Forest in particular, will soon be greatly augmented, and with this augmentation will follow, as a natural result, the application of this knowledge to economic ends.

SCIENTIFIC PAPERS.

ON THE TWO SPECIES OF BLACKWOOD FOUND IN
SOUTHERN INDIA.

BY T. F. BOURDILLON, F.I.S.

When Col. Beddome was writing his description of *Dalbergia latifolia* for his 'Flora Sylvatica' some thirty years ago, he made the following remarks:—

"The *Dalbergia sissoides* (Graham), common about the forests of the Coimbatore district, Palghat, the Anamallays, Madura and Tinnevely, is a smaller tree than *D. latifolia*. The wood is generally of a redder colour, and the tree flowers in the rainy season (July), instead of the hot weather: it is always distinguished by the Palghat axemen as the Eeruputu, *D. latifolia* being called Eetee (Dr. Wight transposed these native names). I cannot however distinguish the two trees botanically; the flowers of the *sissoides* are said to be rather larger and the leaves narrower, but these differences are not constant, and the same drawing might answer for either tree; I cannot therefore look upon *sissoides* as more than a variety of *latifolia*."

This view was accepted for a long time, and all specimens of blackwood from Southern India were labelled *D. latifolia*. Later writers, however, have expressed the opinion that the two were different species, though the difficulty has always been to describe their points of difference. Thus Mr. Gamble in his 'Manual of Indian Timbers' at page 252 says: "The specimen, No. W. 3851, is probably *D. latifolia* var. *sissoides*, which seems to deserve specific rank." Again, Major Prain in his monograph on the species of *Dalbergia*, page 82, writes of *sissoides*: "This species is very nearly related to *D. latifolia*, and may indeed be only a form of that tree; the distinctions, however, seem constant so far as India is concerned, and the wood-cutters of Southern India are said to distinguish the two by their habit and their timber, and

to give them different names." Sir D. Brandis holds the same view.

Some months ago Major Prain asked me to ascertain if *D. latifolia* really occurred in Travancore, as all the specimens sent to him and labelled *latifolia* had turned out to be those of *sissoides*, and since that time I have been making enquiries in different quarters as to the existence of both species or of only one. I soon ascertained that there was a complete unanimity among all carpenters and timbermen that there were two different woods known as "eetti," and further, the samples brought to me invariably showed the same differences, and could always be distinguished. They are known as "kár-eetti" or dark black wood, and "vell-eetti," or pale black wood, and the common vernacular names for both are in Tamil "thothagatti" and in Malayalam "eetti" and "veetti."

Having satisfied Major Prain that *D. latifolia* does occur in Travancore, the next point to be determined was which of the two kinds of wood was to be referred to *latifolia* and which to *sissoides*. I was also anxious to discover if the two species could be early distinguished when growing in the forest, for Herbarium specimens are not always easy to separate.

Further enquiries and examination of trees cut for the purpose showed that the darker wood or "kar-eetti" is *D. latifolia*, and the paler or "vell-eetti" is *D. sissoides*. I also ascertained that when in young leaf the trees can be easily distinguished, even at the distance of a quarter of a mile; but when in mature leaf, they are not so distinguishable, although they can always be separated without difficulty. I will now give in detail the differences between these species.

General appearance.—*D. latifolia* attains a larger size, its foliage is more compact and always a dark blackish-green, whereas the foliage of *D. sissoides* is at first bright grass-green, and even when mature it is never so dark as the other.

Foliage.—In *D. latifolia* the number of leaflets is 3—7, generally 5, and the length of the rachis is 3-4, but rarely 5 inches. In *D. sissoides* the leaflets number 5—10, generally 7, and the rachis is 5-6 inches long. In *D. latifolia* the petiolules are very short

and slender (under $\frac{1}{4}$ inch) and the leaflets are round, obtuse or emarginate, the outermost being the largest, and the others decreasing in size inward. In *D. sissoides* the petiolules are longer (from $\frac{1}{4}$ — $\frac{1}{3}$ inch) and stouter. The leaflets are pointed at both ends and are all of the same size or nearly so. The young leaves of *D. latifolia* are very dark-green, and the mature leaves are black-green above and glaucous beneath and somewhat thin, but the young leaves of *D. sissoides* are very bright-green, and the mature leaves are a lighter-green above and paler beneath, thicker and more glabrous than those of the other species.

Inflorescence.—The flowers of *D. latifolia* are arranged in lateral panicles, axillary or from the axils of fallen leaves, and rarely terminal. Those of *D. sissoides* are terminal and are slightly larger. In other respects they are similar. Both trees flower in January-February.

Fruit.—Major Prain notes that the fruit of *D. sissoides* is narrower and at the apex less rounded than in *D. latifolia*. Further, the apex of the fruit in *D. sissoides* appears to end in a bristle which is absent from *D. latifolia* (*vide* Plates 62-63 of Vol. X of the 'Annals of the Royal Botanic Gardens,' Calcutta).

Timber.—The ground-colour of both woods is purple, but whereas that of *D. latifolia* is uniform in colour or is veined with black or red lines, and in some cases is a beautiful lake (whence no doubt the name of Rosewood) the wood of *D. sissoides* is much mixed with dark-brown and never has any tint of red in it. Some samples resemble walnut or one of the *Albizzias*.

The best way of identifying the species is to split a piece of the wood, when the red or brown tint will at once be seen mixed with the purple. Carpenters state that the wood of *D. sissoides* is harder, heavier, coarser, and does not take such a good polish as that of *D. latifolia*. My experiments with *D. sissoides* give $W = 52\text{lbs.}$ $P = 721$.

I have not experimented with *D. latifolia*, but Mr. Gamble takes as an average (quoting Sir D. Brandis) $W = 50\text{lbs.}$ $P = 950$, but says that the latter figure is too high. Probably there is not much difference in their weight and strength.





Photo. A. B. Jackson.

Two-year old Teak Plantation, Nilumbur.

Both timbers sell for about the same price, but most people prefer *D. latifolia*.

Habitat.—Speaking generally, it may be said that *D. latifolia* prefers the interior forests and *D. sissoides* the outer-hill slopes; in fact they are known in some parts of the country as “Ulmalei” or blackwood of the inner-hills, and “Poromalei” or blackwood of the outer-hills. The former ascends the hills to a greater height, but I have seen *sissoides* at 2,000 feet. At the lower elevations *sissoides* predominates, but *latifolia* is also found, and from the abundance of small plants of this species it may be inferred that it was at one time more common in easily accessible parts than it is now.

Now that these trees have been separated as true species, it would be convenient to give them different English names. *D. latifolia* is generally known as “Bombay rosewood.” For *D. sissoides* I would suggest the name of “Malabar blackwood.”

ORIGINAL ARTICLES.

THE NILAMBUR TEAK PLANTATIONS.

By R. McINTOSH, M.A., I.F.S.

On the west coast of Madras and lying to the north of Travancore and Cochin States is situated the district of Malabar, the home of the Nair and the Moplah, and the scene in former days of many a struggle for supremacy between the British troops and the invaders from Mysore under Tipu and Hyder Ali. Seringapatam settled the fate of Malabar, and now all is peace except on the rare occasions when a band of Moplah fanatics “goes out” and, after a brief space of defiance, meets its inevitable fate at the hands of a few British troops.

Nilambur is a small village situated some 45 miles from the coast up the Beypore river, and lying close to the foot of the Neilgherry Mountains. The Nilambur Valley is described in the district manual as being of the shape of a horse-shoe,

surrounded on three sides by hills which rise on the north-west to 8,000 feet, while those on the north-east obtain an elevation of some 3,000 feet and lead on to the Wynaad plateau. In the semi-circle of these overhanging hills lies Nilambur, situated about 400 feet above sea level, with a rainfall which averages 120 inches and a temperature in the shade ranging between 80 and 90 degrees the whole year round. The soil of the valley is mainly an alluvial deposit, often of enormous depth and broken at intervals by patches of laterite, which sometimes take the form of small detached hills.

On one of these small hills stands the District Forest Officer's residence, whence from the verandah he can overlook the river flowing past the foot of the hill and the plantations which stretch away northwards, mainly along the banks of the river and its tributary streams. Here, alone, a Forest Officer has lived for the past sixty years, shut off from society of any sort, living a monotonous and almost primitive existence, but employed in the creation of a plantation which bids fair to be one of the most successful undertakings, both pecuniarily or otherwise, on which the Forest Department in India has ever been employed.

The sole credit of originating the plantations is due to Mr. Conolly, a Collector of Malabar. As long ago as 1840 he foresaw that the teak forests of Malabar could not long withstand the demand made on them by private rapacity and public indifference, and he suggested to Government the desirability of forming teak plantations in the Nilambur Valley.

Had Mr. Conolly searched throughout the whole of India he could not, in all probability, have hit upon a spot more suitable for his purpose than this Valley. Soil, rainfall and temperature are all that could be desired. The plantations are situated on the banks of an almost ideal floating stream, which flows into the sea at Beypore, a small port much frequented by small trading vessels from the Persian Gulf and Arabian Sea. These traders eagerly compete for the produce of the plantations, shipping it to Persia and Arabia to supply the requirements of those countries, where building timber and poles for boat masts cannot be obtained.





Photo, A. B. Jackson.

Officers' Camp Rest-house, Nilumbur.

Mr. Conolly obtained the requisite permission to start the plantations. A commencement was made at once, and there are papers on record which show that in 1844 Mr. Conolly was perplexed with the difficulty of getting teak seed to germinate and the young plants to withstand transplanting. In 1844 Chattu Menon was appointed native Conservator under Mr. Conolly, and from that date until 1862 he continued in sole charge of the plantations.

Mr. Conolly remained long in Malabar, and ultimately came to an untimely end in September 1855, when one evening, whilst sitting out in the verandah with his wife, he was attacked by three Moplahs and hacked to pieces in her presence.

Much of the land in Nilambur Valley is private property, but it fortunately happened that in 1840 one of the numerous landowning temples required ready money, and a considerable area of highly suitable land was obtained by Government on payment of a lump sum down and a royalty on every teak tree grown on the area. Subsequently Government were able to obtain further areas either on similar terms or by purchase, and the Department now possesses suitable lands amply sufficient for planting purposes.

Chattu Menon soon overcame the difficulty experienced in getting the seed to germinate, and the method adopted by him is, with a few minor modifications, retained to this day. The seed is collected in February, and sown early in April, after having been soaked for forty-eight hours in water. In sowing the seeds are covered to a depth of about $\frac{3}{4}$ inch with fine soil. On this a few small twigs are placed and on the top a layer of straw to retain the moisture. After copious watering each day the seed germinates in 15 to 20 days. The young plants are watered until the setting in of the monsoon early in June, by which time they are from 4 to 8 inches high and ready to be planted out. The planting site is felled over in the cold weather, burnt over in March, and the planting pits made ready for the planting out which is to commence in June.

From the commencement, on an average, 100 acres have been planted up each year. The work was stopped for some years

when a Conservator took a pessimistic view of the operations, but fortunately wiser opinions subsequently prevailed, and the planted area at the end of 1904 amounted to 5,378 acres.

Much credit is due to Chattu Menon for his work at Nilambur. With the exception of attempting to plant teak on the laterite areas and not realising the importance of early thinnings in his plantations he hardly made a mistake.

With the advent in 1862 of Mr. Ferguson, a Scotch gardener imported for the purpose, planting went on apace. He soon realised the vital importance of regular weedings and adequate thinnings. He prescribed four weedings in the first two years, three in the next three years, and two for the sixth year. These weedings have since been reduced to three in the first two years and two subsequently, with a weeding in the older plantations once in every five years.

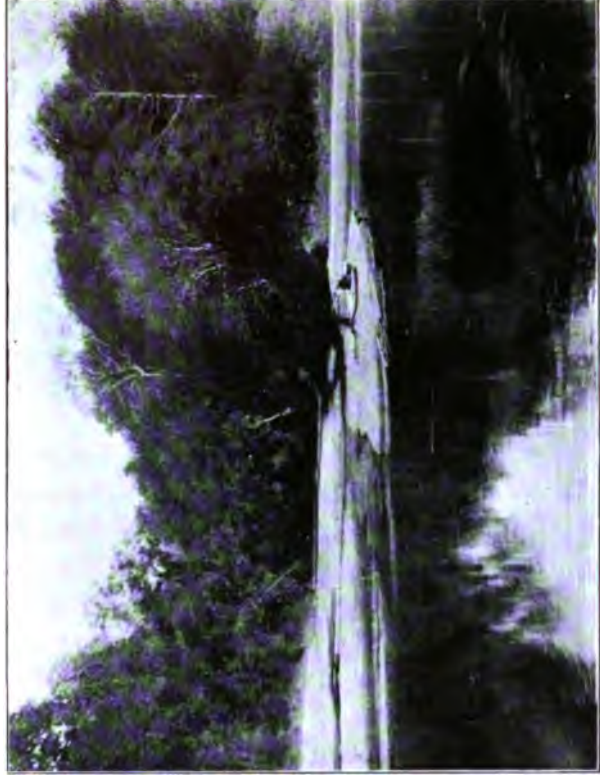
Mr. Ferguson remained at Nilambur until 1883, when he was succeeded by Mr. Hadfield, who left the plantations as recently as 1894.

In 1885 a scheme was drawn up for the conduct of the thinnings, and in 1891 this was revised. In 1895 Mr. P. M. Lushington drew up the first working plan for the plantations. It covered a period of ten years, and is now in course of revision by the same officer.

Under the working plan it is proposed to treat the plantations under the system of high forest with a clean felling of the final crop followed by artificial regeneration. On first class soils the final crop should consist of forty trees per acre and on second class soils not less than fifty trees per acre. The original planting was $6\frac{1}{2}' \times 6\frac{1}{2}'$, *i.e.*, 1,040 plants per acre. It is estimated that the age at which trees on first class soils will become exploitable, that is to say, will measure 6' 6" in girth, will be 95 years and on second class soils 140 years. The final fellings will be spread over a period of fifty years, and are estimated to yield annually 148,000 cubic feet of first class and 74,000 cubic feet of second class timber. This at the rate of Rs. 3 per cubic foot for first class and Rs. 2 for second class timber should provide a net



Photo, A. B. Jackson.



Views on the Beypore River, Nilumbur.

revenue of close on six lakhs per annum during the final fellings.

That the rate of growth on the better soils is marvellous, and that the exploitable age has not been underestimated, is shown by the fact that it is by no means unusual to find among the older plantations, which are now about sixty years old, trees which exceed 120 feet in height and 7 feet in girth.

It is difficult to realise that in these plantations the Madras Government possesses a property which will, unless something very untoward happens, in about 35 years from now commence to yield a net profit of some six lakhs per annum, irrespective of the revenue which will be derived from the thinnings going on in the younger plantations concurrently with the removal of the final crop.

These thinnings are in themselves of considerable importance. They yield a very large revenue, and until the time comes for the removal of the final fellings they are of primary importance. It is hoped that the revenue from the thinnings will very considerably more than cover the entire expenditure on the plantations, leaving the final crop as clear profit. Nor can it be said that this is too sanguine a view to take. The results from the commencement up to date much more than justify this estimate. From 1840 to 1904 the total receipts from the plantations have amounted to Rs. 17,41,739, while the total expenditure, including land purchase amounts, establishment and every other charge which could possibly be set against the plantations, only amounts to Rs. 15,32,308. In other words, the plantations so far have not only paid for themselves but have in addition provided a bonus of over two lakhs.

In arriving at the above result the question of interest has been left out of account, and consequently the figures do not show the true state of affairs.

If compound interest at 4 per cent is allowed, then the expenditure up to date amounts to Rs. 37,14,091 and the revenue to Rs. 35,31,013—that is to say, the Forest Department at the present moment is less than two lakhs out of pocket over

the plantations, and as a set-off against this cash deficit has, in addition to the ownership of the land which has been acquired for the plantations, an area of over 5,300 acres stocked with teak from 60 to 1 year old, the value of which at the present moment must be, although it is not easy to estimate it, something very large indeed.

THE FORESTRY EXHIBIT AT THE BOMBAY INDUSTRIAL AND AGRICULTURAL EXHIBITION.

An Industrial and Agricultural Exhibition was held in Madras last year simultaneously with the meeting of the National Congress there, and this year a similar exhibition has been held in Bombay, but on a much larger scale. A not unimportant part of the collections was the Forestry Exhibit, and we propose to give here a brief description of its more important features.

The Forestry Section was divided into three groups : (a) Economic Products ; (b) Timbers ; (c) Miscellaneous. These groups were shown in sheds with sloping roofs made of bamboo framework, covered with canvas and lined inside with white cotton sheeting. The western and northern portions of the sheds were enclosed by walls lined also with white cotton sheeting. These walls, which were about 8' 4" high, extended almost up to the roof, leaving a space of about 1½' for ventilation. The Economic group was 69' × 33' and the other two were 37' and 33' × 30' respectively.

In the centre of the Economic group was a wooden structure 3' × 12' surrounded by a rope-railing consisting of tiers of shelves rising on either side and culminating in a top ledge 3' broad. Arranged on the tiers of this structure, were economic products of all descriptions, consisting of roots, tubers, leaves, fruits, seeds, barks, fibres, gums, resins, oils, honey, rubbers, lac (in all its stages), specimens of water-yielding plants, articles of bamboo manufacture, native musical instruments, made of various woods, etc. It would occupy too much space to describe in detail the various exhibits under the above heads, but it may be of interest to touch upon a few of the more prominent ones.

Roots and Tubers.—Among these the roots of *Pogosternon plecthranthoides* and *Plumbago zeylanica* are the most interesting. The juice of the former is utilised in snake bite and is alleged to be a specific in such cases as is the latter in plague. The juice of the roots is apparently rubbed on the swellings which occur in plague and effectively burns them out. The wild yams are represented by large specimens of *Dioscorea bulbifera*, *D. pentaphylla*, *D. dæmona* and others, and by interesting specimens of the tuberous root stock and sheathing leaf stocks of the wild plantain (*Musa superba*), which are of considerable economic value according to a paper read by Mr. Ryan recently before the Bombay Natural History Society, and published in the Society's 'Journal,' Vol. XV, page 586.

Rubbers.—Good specimens of *Ficus elastica* and *Hevea braziliensis* have been supplied by Lieut.-Col. Wyllie, Cantonment Magistrate of Belgaum, well known as the originator of certain large rubber plantations in Burma. Professor Gammie, of the College of Science, Poona, also supplied a specimen of rubber obtained from *Oryptostezia glandiflora*, a climber which is said to be spreading about gardens in the Konkan. Professor Gammie, it may be mentioned here, also supplied some excellent herbarium specimens of well-known forest trees for exhibition as well as photographs of the same.

Water-yielding Plants.—These included wood specimens of and liquid from *Calycopteris floribunda*, *Vitis adnata* and *Ficus glomerata*, and liquid from the gram plant (*Cicer arietinum*) and Sugarcane (*Saccharum officinarum*), and Cocoanut (*Cocos nucifera*).

Copy of a paper recently read before the Bombay Natural History Society on the water-yielding properties of *Calycopteris floribunda* accompanies the wood specimens of the plant on exhibit, together with a large photograph of the climber as seen in the Thana Forests. It appears that a sample of the liquid from the stems of this plant was analysed by the Bombay Municipal Analyst, through the courtesy of Mr. Hervey, C. I. E., Municipal Commissioner, Bombay, and that it was declared fit for drinking purposes. In addition to its utility as a water-yielding plant it is

of considerable economic value as a spirit ; also in providing material for what is known as tahal for rab in the Konkan. The climber is difficult to eradicate, for, in addition to its coppicing well, it also reproduces itself by root-suckers and by means of its stoloniferous branches.

Ficus glomerata yields a reddish fluid from the roots by incisions made in them, and as much as a quart can be obtained in a night. This is used medicinally as a cooling draught after measles and small-pox especially.

In the case of the gram and sugarcane the liquid is gathered from the leaves, and the note accompanying the former is as follows: "A piece of cloth is tied to a long pole in the form of a flag, and this in the early morning is swept over the field of gram, whose leaves are all bedecked with dew. The moisture thus captured is wrung out and bottled, and is used in diarrhoea, in cholera, and also in other stomach complaints.

Lac.—The exhibits under this head are especially of interest to the merchant, for they include the insect, branches covered with the lac incrustation from Sind and Guzerat, stick lac and shellac, and lacquerware from Sind. Large quantities of lac are obtainable in Sind, chiefly on the Babul (*Acacia arabica*) and also on Khandi (*Prosopis spicigera*), and in Guzerat on *Butea frondosa*, and other jungle wood trees.

Seeds.—The uses to which various forest seeds are applied are demonstrated in an interesting exhibition of chicks and other articles such as necklaces, curtain loops, flower vases, etc., made of seeds by the Sisters of the All Saints Home, Mazagon. Job's tears (*Coix lachryma*) are very prominent in the collection, and there is a very handsome door chick, exhibited with the permission of Mrs. H. S. Lawrence, made of *Coix gigantea* seeds and alluded to by Sir George Watt in his Note on *Coix*, recently published by the Government of India.

It may be mentioned in passing that the All Saints Sisters would be very grateful if seeds of a hard texture such as *Elæocarpus Ganitrus* and *Cæsalpinia Bonducella*, *Mimusops Elengi*, *Ade-nanthera pavonia*, etc., were supplied to them for the purposes of

their industry at Mazagon, and they will be happy to pay for any seeds sent, provided of course the cost of collection, etc., is not too heavy. At present they purchase *Elæocarpus Ganitrus* seeds in the Bombay bazar at about 4 annas per 100. Seeds of that giant climber *Entada scandens* are largely utilised by them, and will be thankfully received. This is one of those plants the seeds of which might be collected for ornamental purposes without any misgivings, for the plant is of no value except to the wild tribesman in the Konkan, who uses the bark for cordage.

The seed collection forms a very interesting feature of the Forestry Exhibit, and has attracted large numbers of visitors.

Fibres.—About thirty different fibres are exhibited, and noticeable among them is the Sisal fibre from *Agave rigida* together with specimens of the handsome matting made from it, and three very handsome specimens of the plant, one in the poling stage. The Rev. W. Winsor of Sirur in Poona, who is responsible for this exhibit, also shows an interesting new machine for extracting the fibre from the leaves, a patent for which has been applied for. This machine is likely to be in much demand judging by enquiries. There is little prospect, however, at present, of Sisal fibre matting competing with Coir, for the price of the former ranges from Re. 1 to Rs. 1-4 per foot against annas 6 for the latter.

Timbers.—All the best timbers exhibited are mainly from the Kanara Forests, and they include teak, black wood, *Albizzia lebbek*, *Calophyllum tomentosum*, *Artocarpus hirsuta*, *Artocarpus Lakoocha*, *Alseodaphne semecarpifolia*, *Chickrassia tabularis*, *Shorea talura*, *Mimusops Elengi*, *Dysoxylum glandulosum*, *Calophyllum Inophyllum*, *Terminalia tomentosa*, *Phyllanthus emblica*, *Stephegyne parviflora*, *Eugenia jambolana*, *Gmelina arborea*, *Cassia fistula*, *Adina cordifolia*, *Albizzia odoratissima*, *Bauhinia racemosa*, *Schleichera trijuga*, *Albizzia procera*, *Stereospermum xylocarpum*, *Pterocarpus marsupium*, *Anogeissus latifolia*, *Hopea Wightiana*, *Artocarpus integrifolia*, *Terminalia paniculata*.

A good specimen of Anjan (*Hardwickia binata*) was sent from Khandesh and of *Populus euphratica* from Sind. But the

above does not exhaust the list of species exhibited. Most of the specimens are displayed in rectangular pieces, 4 feet long and from 1 foot to 2 to 4 feet wide by 1", half being polished by Messrs. Alexander Mackenzie & Son of Bombay. Through the courtesy of the latter two very handsome pieces of Teak also are exhibited, one being a specimen of Figured Teak from the Haliyal Dépôt, Kanara.

The rectangular pieces of timber bear detailed descriptions of the uses to which they are adaptable, and they are all arranged so as to facilitate inspection.

Timber in the log and blocks for street paving 9" \times 5" \times 3", of the size used in London, were also exhibited. A note attached to the latter shows that the qualities needed for such blocks are that they should be hard but not brittle.

An interesting exhibit, priced at Rs. 250, is a collection of small blocks of timbers, representing volumes in a book shelf, bearing their scientific as well as native names. This exhibit won a prize at the Madras Exhibition last year. It was prepared by Mr. A. V. Coelho, Timber Contractor, in Kanara.

A trophy (of 31 different timbers, all from the Konkan), designed by Mr. Murzband, C.I.E., Executive Engineer (retired), stands in the form of a pyramid in the quadrangle behind the Economic and Timber Courts. Two bamboos from the Bansda State, in Guzerat, one 75 feet high, are erected close to the trophy.

Miscellaneous.—Under this head the process of charcoal manufacture, which forms an important industry in the Presidency and Sind (about 50,000 tons being manufactured annually), and an interesting hay press, erected for the first time and designed by a Parsee, Mr. Irani, Range Forest Officer, are exhibited. From the note appended to the hay press it is gathered that during the last famine (1899-1900) the Bombay Forest Department collected and pressed over 18,000 tons of grass by means of hand-presses and despatched the same to the famine-stricken areas, and that hay-pressing operations with Mr. Irani's new press are now about to be carried on in Khandesh to meet the demand for fodder in Guzerat.



Mr. Irani is to be congratulated on having invented a very useful machine, the patent for which has now been applied for.

Photographs.—Most of these, representing forest problems and operations, are the work of Messrs. Limaye and Budbudé, Rangers in the Thana District, and some have been provided by Mr. R. S. Pearson, I.F.S. An excellent series of photographs of Palms introduced into and indigenous in Bombay are exhibited by Mr. H. M. Phipson, chief of the energetic Secretaries of the Bombay Natural History Society. Three interesting photographs by Mr. E. R. Stephens, I.F.S., showing the Dehra Dun Forest School Building and Students' Quarters, kindly sent by the Director of the School, are also exhibited.

Maps, Working Plans and Forest Literature.—A map, on a scale of 48" to 1 mile, showing the distribution of Forest lands in the Bombay Presidency, supplied under the authority of the Inspector-General of Forests and through the courtesy of the Superintendent of Forest Surveys, is on exhibition, as also a map of one Working Circle of the Forests of the Wada Range, Central Thana Division. A brief popular description in large type of the method of exploitation of the Thana Forests, which are adjacent to Bombay, accompanies this map, and below on a table are arranged printed copies of all the sanctioned Working Plans in the Presidency and Sind for the benefit of those who may wish to know more about the management of the Forests in other parts of the Presidency.

The standard works on the Forest flora of the country are also exhibited.

Two Native States, Bansda and Baroda, have included their exhibits in the Forestry Courts.

To add to the interest of the Exhibition a few representative wild tribesmen from the Konkan were brought in, and the methods by which they trap and snare birds and animals are demonstrated by themselves. This naturally has formed a very popular feature of the Exhibition. Through the courtesy of Col. Bannerman, of the Parel Research Laboratory, the various poisonous snakes of India are also exhibited alive in glass cases, and three times a week

practical demonstrations are given in extracting the venom from the snakes and on feeding them. It appears that antivenene as at present prepared at Kasauli is useless for the venom of any but the Cobra and Naia Tripudians.

The following are the snakes exhibited : Cobra, Naia Tripudians, common Krait, Bungarus Cœrulens, Fursa, Russell's Viper, and the green pet viper, Lachesis anamallensis, one of the representatives of the Rattlesnake in India.

Through Mr. Mahalaxmiwala, Superintendent of the Victoria Gardens, Bombay, about fifty living specimens of plants, mainly of economic value representing Rubbers and Fibres, adorn the Economic section, and there may be also seen here a specimen of the teak and camphor trees. A specimen of the quinine plant, the only one probably in the Presidency, was also exhibited.

Bearing in view the short time granted in preparing for the Exhibition, *viz.*, about two months, and the sum allotted for expenses of the Forest Section, Rs. 2,000, the latter may be said to have been eminently successful.

Mr. G. M. Ryan, F.L.S., Deputy Conservator, Bombay Presidency, was the organiser of this Forestry Exhibit, and he is to be congratulated on the success which has attended his efforts.

CORRESPONDENCE.

FIRE PROTECTION IN THE TEAK FORESTS OF BURMA.

I.

A number of letters have lately appeared upon this subject in the pages of the *Indian Forester*. So far, however, no attempt seems to have been made to enumerate the teak seedlings and young poles in two adjoining pieces of forest of similar description, one of which has been successfully protected for many years and the other annually burnt from time immemorial. It is the purpose of this article to record the results of an enumeration of

teak seedlings and young poles in two adjoining areas of moist mixed forest of precisely similar nature, one of which has been fire-protected since 1872-73 and the other burnt annually. This enumeration was carried out by the writer during January 1905, the two pieces of forest enumerated being (1) the north-western portion of Compartment 4 of Kadinbilin Working Circle, Tharrawaddy Division, and (2) the unclassified forest lying immediately outside the external fire-line of Compartment 4 of Kadinbilin Working Circle. These two areas will be referred to below as Plot A and Plot B, respectively. A brief description of each plot will serve to explain the figures recorded below :—

(1) *Plot A*.—Area 37 acres. In the north-western corner of Compartment 4, Kadinbilin. Moist, upper mixed forest in hilly country, the slopes varying from gentle to moderately steep. The forest is rich in teak, which is far more plentiful than any other species. Bamboos cover the ground throughout, the species being *Kyathaungwa* (*Bambusa polymorpha*) and *Tinwa* (*Cephalostachyum pergracile*). The bamboos are heavily cut every year by bamboo-cutters, while bamboo dragging paths traverse the area in several places; this renders the bamboo canopy much more open than is usually the case in fire-protected forest, large gaps being frequent. Fire protection was started in 1872-73. There are no detailed records as to the success of fire conservancy until the year 1888, but we know from the annual fire maps that since 1888 this Compartment has never been burnt. Works of improvement appear to have been carried out between 1875 and 1880; these consisted of girdling inferior species, teak seed being dibbled in over part of the area. Improvement fellings were carried out in 1898-99, but no seed was dibbled in.

(2) *Plot B*.—Area 24 acres. Within a stone's throw of Plot A, but outside the fire trace, in unclassified forest which is burnt annually. As in the case of Plot A, the forest is moist upper mixed forest, the slopes varying from gentle to moderately steep. The proportion of teak over two feet in girth is perhaps equal to, and is certainly not greater than, that of Plot A. The bamboos are similar to those of Plot A, and are felled annually for

extraction. Owing to annual burning, however, the undergrowth of small-sized bamboos, characteristic of fire-protected forest, is almost entirely absent. In every respect the two Plots must have been practically identical before fire-protection was started. It should be stated that the difference in the areas of the two Plots is accidental. It was thought at the time when the plots were marked out that the areas would be approximately equal, and it was only on computing them afterwards that they were found to differ so much.

The enumerations.—The object of the enumerations being to ascertain the effect of continued fire-protection on the natural reproduction of teak, only teak trees below two feet in girth were enumerated, as only these could have been affected by fire-protection during the past 30 years. As a matter of fact it was found by felling a few poles in Plot A that in this Plot it takes a teak tree about 20 years (excluding the time taken to establish itself) to reach a girth of one foot. The trees enumerated in each Plot were divided into three classes, two of which were again divided into two sub-classes each, as follows :—

- | | | |
|---|---|-----------------------|
| CLASS I.—Poles 1 foot to 2 feet | } | (a) Sound. |
| in girth. | | (b) Unsound and dead. |
| CLASS II.—Poles and saplings | } | |
| under 1 foot in | | |
| girth, i.e., saplings | | (a) Sound. |
| which in unprotected forest | | |
| would be well out of reach of all ordinary fires. | | (b) Unsound and dead. |

CLASS III.—*Seedlings* (so-called), i. e., young teak plants which in unprotected forest are not out of danger from fire.

The vast majority of these are in reality not seedlings but new shoots from saplings killed by fire or suppression. For the sake of convenience all these will be referred to below as seedlings.

The following is a tabular record of the actual enumerations carried out in the two plots :—

CLASS.		Number of poles, saplings and seedlings in each plot.		Corresponding number of poles, saplings and seedlings in 50 acres.	
		Plot A, 37 acres, fire-protected.	Plot B, 24 acres, unprotected.	Plot A, fire-protected.	Plot B, unprotected.
I. Poles 1 foot to 2 feet in girth.	(a) Sound ...	129	65	174	135
	(b) Unsound and dead ...	81	14	109	29
II. Poles and saplings under 1 foot in girth.	(a) Sound ..	18	68	24	141
	(b) Unsound and dead ..	90	18	121	37
III. Seedlings	...	16	296	61	616

A few remarks on the condition of the plants in each class will be necessary to more fully explain these figures.

Class I, poles 1 foot to 2 feet in girth. In Plot A (fire-protected forest), nearly half of the 129 sound poles are still in danger of suppression by bamboos, and were it not for the extensive bamboo cutting annually the number of sound poles would undoubtedly be much smaller. In the same plot, of the 81 unsound and dead poles, some 75 per cent have been killed outright by suppression, while the remainder have been so suppressed by the bamboos that there is no hope of their ever recovering. In Plot B (annually burnt) the 65 sound poles bear no signs of damage from fire; they are vigorous and have little to fear from future suppression, the annual burning of the bamboos keeping the clumps well apart. Of the 14 unsound and dead trees in the same plot about half are dead, and in every case they appear to have been killed by suppression and not by fire.

Class II, poles and saplings under 1 foot in girth. In Plot A (fire-protected forest) the 18 sound poles are struggling against the bamboos, and only a very small proportion of them can hope to make their way through. Of the 90 unsound

poles about 80 per cent have been killed outright by suppression, and a very few of the remainder will possibly be able to get through the bamboos. In Plot B (annually burnt) a good proportion of the 68 sound poles have every prospect of making their way through the bamboos, owing to the open growth of the latter in consequence of the annual burning. The damage done to the teak poles by fire is almost insignificant; such of the 18 unsound poles as have been killed outright bear every sign of having been killed by suppression and not by fire. On the whole the vigorous appearance of the poles and saplings between 1 foot and 2 feet in girth in the annually burnt plot forms a strong contrast to the unhealthy appearance of the poles and saplings of the same dimensions in the protected area.

Class III, seedlings (so-called). Of the 46 seedlings enumerated in the fire-protected plot some 75 per cent were found on examination to be shoots from the base of saplings killed by suppression; from the weakly appearance of these shoots it appears doubtful if any of them will survive. Of the remaining 25 per cent all but two were found on broad dragging paths and in openings caused by extensive bamboo felling; these latter two were found in more or less dense shade, but they were so weakly that they will probably die off before long. Of the 296 so-called seedlings in the annually burnt area the vast majority are annual shoots from rootstocks, the shoots of which are burnt back each year. These shoots frequently escape damage for one, two, or three seasons in succession, and thus every year a proportion of them get beyond the reach of fire. This fact at once strikes the eye of anyone passing through an annually burnt mixed forest containing teak, and it is fully supported by the figures given above in the tabular record of enumerations, otherwise there is no means of accounting for the large proportion of sound saplings and poles which have got beyond the reach of fire in the annually burnt area.

It is impossible by mere figures, however accurate, or by verbal descriptions, however vivid, to give any idea of the terrible destruction which is being wrought in our once valuable moist mixed forests by prolonged fire-protection. In the present instance

we have a typical piece of moist mixed forest rich in teak produced in the days when the area was annually burnt; we find the large trees, the medium-sized trees, and the small trees in their proper proportions, but there it ends. The vigorous poles, saplings and seedlings which we find in profusion in an area identically the same, but which has been annually burnt over, are in the protected area conspicuous by their absence, and in their place we find masses of dry sticks representing the formerly vigorous teak poles and saplings which have been killed by the suppression of the favoured bamboos and soft wooded species. There is only one conclusion to be drawn, and that is that we are most certainly exterminating our teak by fire-protection. The moist upper mixed type of forest with *kyathaungwa* and *tinwa* bamboos is by far the most important type with which we have to deal in the Pegu Yoma Forests, as it produces the best class of timber. The plots chosen for enumeration on the present occasion are exactly typical of many hundreds of square miles of moist mixed forest in the Pegu Yomas, and what holds good for these plots will hold good for the great mass of forest. If anything the protected plot enumerated on this occasion gives a more favourable view of the results of fire-protection than it should do, for not only have works of improvement been carried out on two occasions during the past 30 years (a most unusual thing) but such extensive bamboo felling as is carried out annually in this area is quite unknown in the vast majority of our forests, and is accountable for nearly all the seedlings and saplings which do exist.

It must be difficult for anyone who is acquainted with the beneficial results of fire-protection in other parts of India to grasp the fact that it is exterminating the teak in the moist mixed forests of Burma. The writer himself has seen something of the wonderful results of fire-protection in Northern India, and would be the last person to condemn it in any case where the results were beneficial. In a Himalayan forest of *Pinus longifolia* for example, the effect of fire-protection is to produce a mass of natural regeneration which could not possibly be obtained if the forest were burnt annually. In a Burma moist mixed forest the result as

far as teak goes is precisely the opposite. Prolonged fire-protection kills out the young teak, and in time we shall be left with nothing but mature trees in our fire-protected forests ; when these are removed we shall have no teak at all. In an annually burnt mixed forest containing teak, in which gaps have been formed by the felling of trees of other species, we frequently find masses of vigorous young teak saplings and poles, the majority undamaged by fire owing to the power of teak to resist damage by that element ; such a spectacle, which the writer has never observed in a fire-protected forest, at once calls to mind the masses of vigorous young *Pinus longifolia* plants in a fire-protected forest of that species. The burning accomplishes in the one case what the fire-protection does in the other.

The state of affairs revealed by the enumerations in the present instance can perhaps be most forcibly represented by the aid of a couple of diagrams, based on the figures in the tabular record of enumeration given above. We may neglect all dead and unsound poles and saplings as having no future. We may also neglect trees above two feet in girth, as these trees may be assumed to have established themselves before the days of fire-protection : confining ourselves therefore to seedlings 'so-called, and to sound poles and saplings under two feet in girth we obtain a graphic representation of the enumerations in the following two diagrams :—

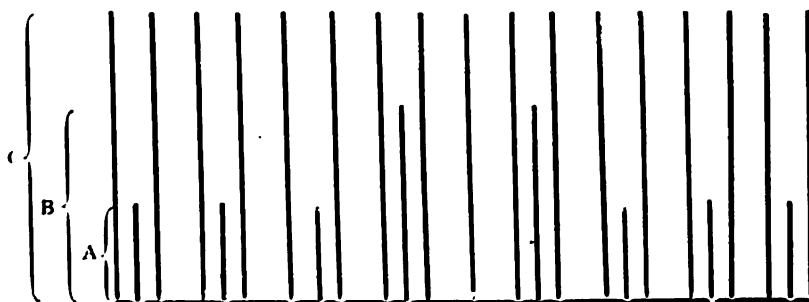


DIAGRAM I.—Representation of sound young teak in 50 acres of moist mixed forest which has been fire protected for 30 years. Each stroke represents 10 plants.

A = Seedlings, 62 (including shoots from the bases of dead saplings).

B = Saplings under 1 foot in girth, 24.

C = Poles and saplings 1 foot to 2 feet in girth, 174.

Note.—Nearly all of A and B, and a good proportion of C, are in danger of being killed by suppression.



DIAGRAM II.—*Representation of sound young teak in 50 acres of moist mixed forest which has always been burnt annually. Each stroke represents 10 plants.*—

A = Seedlings, 616 (including shoots from the bases of dead saplings) not yet out of danger from fire.

B = Saplings under 1 foot in girth, out of danger from fire, 141.

C = Poles and saplings 1 foot to 2 feet in girth, 135.

Note.—The great majority of B and C have little to fear from suppression, and may be expected to develop in the ordinary course of events.

This article is not intended to be a tirade against fire-protection in general, but it does claim to reveal the correct state of affairs in natural moist upper mixed forest containing teak, such as is found in the Tharrawaddy Division. Figures and records of observations in other types of forests are still wanting, and it would be interesting to find out under what conditions fire-protection ceases to be injurious to teak forests and commences to become beneficial. There must be in other parts of Burma many old fire-protected areas, with adjoining unprotected areas of the same type,

in which comparative enumerations could be carried out. The matter is of such vital importance that it is to be hoped that Forest Officers will endeavour to find time to carry out a few such enumerations and favour the readers of the *Indian Forester* with the results.

THARRAWADDY, BURMA :

1st February 1905.

R. S. TROUP,

Deputy Conservator of Forests.

II.

So much has already been written about fire protection in Burma that one hesitates to further trespass on your space; but with your permission I would like to sound one note of warning.

But a few years ago there was a cry for general protection; every Reserve was to be fire-traced at the earliest possible moment, and all other work was to be sacrificed to this end.

There seemed to be a general consensus of opinion that unless a Reserve was protected it was doomed to destruction, and that successful protection only was required to obtain the best possible results from the teak forests in our charge. There were some to whom this line of thought did not commend itself, and the discussion that then ensued led to the more careful study of the question. Since then the opinions of many have undergone a change, and there are probably few Forest Officers in Burma who now regard fire protection as a general panacea, or who would advocate its general and indiscriminate extension. Many would go further and say that all fire protection is unnecessary and even harmful. It is to these that I would address these lines. The pendulum has swung upwards, stopped and is now descending; let us not allow it to swing too far in the opposite direction.

The great objection urged against fire protection is its effect on natural regeneration and, from the many letters that have appeared in your journal, there is very strong presumption that

it is actually harmful in this respect. Let us assume that this is the case ; is it not going a little too far to therefore brand *all* fire protection as a mistake ? Is natural regeneration the only question that the Forester is called upon to study ? Cannot every Forester in Burma point to thousands of acres of teak forest where there is ample regeneration, areas where the seedlings come up in thousands every year only to be burnt back by the annual fires ? Can any practical man urge that in such areas a few years successful protection, to allow these seedlings to attain such dimensions as to place them beyond the effects of fire, will be harmful ? I would urge *moderation*. The solution of the difficulty probably lies in adopting a course midway between the general protectionist and the anti-protectionist. Fire to some is our most useful assistant, to others our most dangerous enemy. From certain points of view both may be right and both may be wrong. Instead of discussing who is right and who is wrong let us rather study how best to control and use fire so as to rob it of much of its harmful power and utilise whatever power for good it may possess.

H. S.

THE DEVELOPMENT OF THE SAL FORESTS IN THE DEHRA DUN.

In the November 1902 number of the *Indian Forester* Mr. Milward wrote a reply to my previous note (published in September 1902) on the above subject, and I should like to make the following remarks with reference to his letter.

At the present day in the Dehra Dun on the plains there are two topographies which must be clearly distinguished, namely, the high ground, which is well above the river beds, which we may call the old alluvium (bhangar) and the low grounds through which the rivers now flow, which we may call the new alluvium (khadir). The same conditions exist in the whole of the Gangetic Plain. In the Dun the old alluvium consists at the surface of clay, and the new alluvium of shingle and sand. Mr. Milward

refers to a former lake period to account for the deposit of clay of the old alluvium, whereas I have considered this to be a river deposit, laid down by floods at a time when the beds of the rivers were at a very much higher level than at the present time, the whole Dun being in consequence a sheet of water or at least a swamp temporarily during the flood seasons. It makes little difference, however, whether we consider the old alluvium to have been laid down in a lake or by flooding from the rivers; the result in either case would be the same, namely, a deposit of clay over the whole surface of the Dun. The next thing is to consider the cause for the beds of the rivers being now so very much lower than the old alluvium, leaving this high and dry without any possibility of flooding. Geologists, as far as I can ascertain, attribute the lowering of the river beds to a gradual subsidence of the land at the Ganges Delta, for which the results of borings have supplied ample data. The lowering of the Ganges Delta would increase the gradient of the rivers and naturally result in vertical erosion, thus leaving the rivers at a much lower level than they were formerly. Owing to the oscillations of the rivers the land has been eroded laterally, gradually reducing the area of old alluvium, so that at the present day we find the rivers between high banks of old alluvium which may be very far apart according to the extent of lateral erosion, and flowing through a large area of low land. This low land is more or less subjected to flooding and is being constantly eroded and again re-deposited, forming the low alluvium, which is therefore a more or less recent topography, which as it forms becomes rapidly clothed with vegetation, which develops up to the mixed forest stage.

Now, from the fact that these mixed forests are on water-transmitting strata, and the sal forests are essentially on clay beds which retain more moisture, Mr. Milward draws the conclusion that the mixed forests do not develop further and give place to sal forest. He seems to consider that the sal forests in the Dun show a decided preference for the clay deposits and the mixed forests for the water-transmitting deposits without any consideration of high or low alluvium. I believe that the sal forests are

essentially on the clay deposits because these are the high or old alluvium and the mixed forests are on the water-transmitting deposits because these are the low or new alluvium, and that this distribution has nothing to do with the fact that the clay beds retain more moisture. Had the high alluvium been of water-transmitting strata, I believe it would now be under sal forest, and were the low alluvium of clay deposits I believe it would still support mixed forests.

Sal evidently extended from the hills on to the high alluvium as the water level became lowered by the lowering of the river beds by vertical erosion, but through the mixed forest stages and not directly. By lateral erosion the high alluvium with its sal forests has been reduced considerably in area to be replaced by low alluvium with its mixed forests. That these mixed forests on the low alluvium have not yet given place to sal may be correct, but for other reasons than that sal prefers the clayey deposits. The fact that these low alluvium strata are water-transmitting is not, I think, the barrier which keeps out sal, for it is well known that the best sal forests are on water-transmitting strata, in support of which I quote the following from Brandis:—"The sal tree does not thrive on heavy binding soils; it requires a loose soil which transmits water freely.....Sal forests are generally found on sandstone, on conglomerate, the gravelly and shingly soil of the Sub-Himalayan tract, and the tree attains perfection where loose water-transmitting soils are mixed with a large proportion of vegetable mould." Sal is found in the Dun up to the top of the Siwaliks and extending to the plains on the Saharanpur side often with the water level at a great depth. Why sal has not yet extended to the low alluvium in the Dun it is not easy to say, and the subject requires further investigation. It may be that the flood level is still too high, and that the necessary conditions to render the locality suitable for sal can only be brought about by a further lowering of the river beds, or that there is a want of humus in the soil, or that frost is too severe. If there are areas of low alluvium which have been left high and dry for a considerable time by the further lowering of the river beds

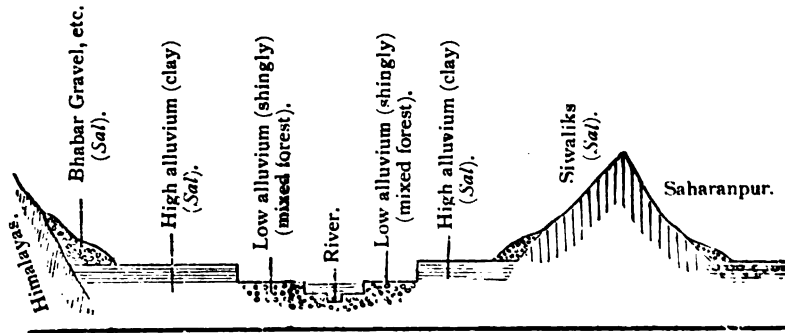
it may be that sal has not had an opportunity of reaching them owing to the heavy nature of its seed.

In connection with this subject there is an interesting article by Mr. F. A. Leete in the September 1903 number with reference to the Kheri Trans-Sarda forests. He shows that in Kheri there are two distinct types of sal forests which he calls high level sal forests and low level sal forests, both being situated on alluvium well above the present beds of the rivers, there being also a low alluvium supporting mixed forests as in the Dehra Dun. This is interesting because it seems to point to a further stage than exists at present in the Dun, namely, sal forests on a level or terrace intermediate between the high alluvium and the low alluvium.

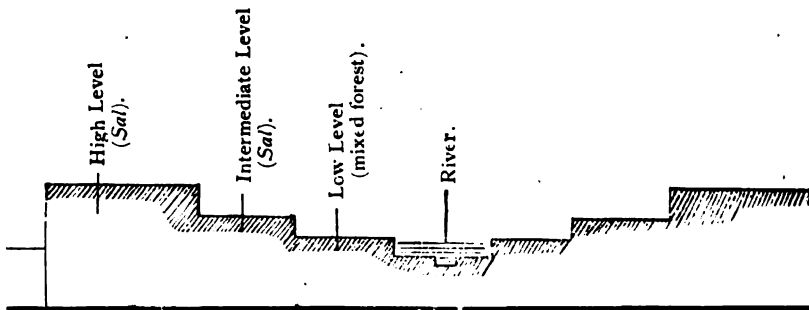
In other words, in the Dun there are, broadly speaking, two terraces, the high alluvium with sal forest and the low alluvium with mixed forest, whereas in Kheri there is a high alluvium with good sal forest, an intermediate alluvium with poor sal forest, and a low alluvium with mixed forest. Taking into consideration the conditions in Kheri it appears probable that by the further lowering of the river beds in the Dehra Dun the present low alluvium with mixed forests will gradually change to intermediate alluvium with sal, as in Kheri.

It should be noted also that in Kheri the best sal forests are on the high alluvium and the poorer sal forests are on the intermediate alluvium, evidently a sign that the latter locality is a more recent topography not yet in a condition suitable for the best growth of sal. It appears that the lower the water levels the better the growth of sal, and as the water level becomes lower the condition of the sal forests on the intermediate alluvium will improve. It will be interesting to maintain records of the water level in these forests; as such data may be of use after a number of years in showing whether there is any improvement in the growth of sal simultaneously with the lowering of the water level, but of course long periods must elapse before any appreciable difference can be detected.

DIAGRAMMATIC SECTION ACROSS THE DEHRA DUN.



DIAGRAMMATIC SECTION IN KHERI (ODH).



In conclusion I still believe the sal forests, where they occur in the Dehra Dun, to have originated through the mixed forest stages, although it would appear from Mr. Milward's note that the mixed forests on the low alluvium have not yet given place to sal "except in one or two instances where sal has extended from the clayey plateau to the lower ground;" but as the river beds become further lowered by vertical erosion I have little doubt that the mixed forests will give place to sal, thus giving the intermediate class of forest as seen in Kheri.

B. O. COVENTRY,
Deputy Conservator of Forests.

REPRODUCTION BY SUCKER SHOOTS.

Similar experiments to those described in the article on "Sucker Shoots" in the April *Indian Forester*, Vol. XXX, were carried out this year on a small scale in the Dehra Dun Division.

Just before the rains some of the roots of standing sal, sandan (*Ougeinia dalbergioides*), and shisham (*Dalbergia Sissoo*) were exposed and also roots belonging to stumps of recently-felled trees of the same species.

The results, which may prove of some general interest, are here briefly given :

Sal, standing	...	No sucker shoots produced.
Sal stumps	...	No sucker shoots : only coppice shoots.
Sandan, standing	...	Result unsatisfactory : only two trees produced one sucker shoot each.
Sandan stumps	...	No sucker shoots : only coppice shoots.
Shisham, standing...		No sucker shoots.
Shisham stumps	...	Very numerous strong sucker shoots and very plentiful coppice-shoots produced, which latter are, however, weak as compared with the sucker shoots.

E. R. STEVENS.

THE KISTNA FLOODS OF OCTOBER 1893, ETC.

In the note under the above heading which appeared on page 615 of the December (1904) issue, planting operations are suggested in order to reduce disasters of this nature. Such planting operations would have little effect if carried out in the Kistna District itself. It is in the Bombay Presidency along the course of the Kistna river and its tributaries and over their catchment areas that forests are required. I am not acquainted with those localities and am ignorant of the state of the vegetation there, but I have good cause to remember floods similar to those under discussion which occurred in August 1896 and which originated in the Bombay Presidency.

The S.-W. monsoon had entirely failed and there was grave fear of famine, which, as is well known, proved only too well founded, since the famine of 1897 ensued.

Over the catchment area of the Kistna however very heavy rain fell continuously for three or four days (quoting from memory and subject to correction, 53 inches in four days), with the result that the whole tract of land between Bezwada and the sea, about 500 square miles, was inundated.

CECIL E. C. FISCHER.

CHATRAPUR, GANJAM DISTRICT :

January 5th, 1905.

THE DIMENSIONS OF BAMBUSA ARUNDINACEA.

It may perhaps be of interest to the readers of the *Indian Forester* to hear that a bamboo culm, felled in November 1904 at Pattazhi in Central Travancore from a clump of *B. arundinacea*, measured $121\frac{1}{2}$ feet long, and had a girth of 20 inches at its middle, the diameter of the cavity being one-third that of the culm. The whole clump consisted of 112 shoots, of which 75 were extracted.

Besides the one above-mentioned there were six shoots of 118 feet long. This particular shoot is said to be three years old ; but as a shoot accomplishes the whole of its growth in height and thickness in the first few weeks of its life, the age is perhaps of little consequence. I may mention that this clump (as also those in the vicinity) had remained untouched since its exploitation in 1895.

It would prove of interest if readers of the Magazine could inform me whether shoots of this species are known to have attained greater dimensions.

CAMP PATTAZHI,

TRAVANCORE :

3rd November 1904.

M. VELU PILLAI,

Forest Ranger.

REVIEWS AND TRANSLATIONS.

THE PROMOTION OF ARBORICULTURE IN AJMER-MERWARA.

Last year in an article on Roadside Arboriculture in India* we drew attention to the fact that the Government of India had under consideration the subject of the maintenance of avenues of trees along roadsides in India. In earlier days this matter was as much a feature of British administration as the construction of the roads themselves; but in recent times, as those who have had opportunities of travelling all over the country know full well, the matter has fallen into almost complete abeyance, and curiously enough the man the most opposed to the practice is in many instances the road-maker or up-keeper himself. But the blame cannot be laid fully upon his shoulders, for many a District Officer, although it would require but a word from him, entirely neglects such matters. How often is it possible to see recently planted trees with their bamboo matting enclosure overthrown and the young trees browsed down by passing cattle : an almost criminal waste of money, leaving other considerations out of the question, but which no one responsible pays any heed to save perhaps to order a new plant to be put in the following year, which shares the same fate. We are of opinion that this wanton destruction of roadside plants upon which Government money has been laid out should be met by a really severe deterrent penalty. Through the courtesy of the Hon'ble the Chief Commissioner of Ajmer-Merwara we have received a copy of a Report, drawn up under his orders by the Forest Officer of the Agency upon this question of roadside arboriculture ; a perusal has shown that here, at any rate, the question is being approached in the proper spirit.

Before the year 1893 there were no rules for planting trees on roads, and very little money was spent in this direction. The old

* Vol. XXX. p. 315

avenues had been woefully neglected. The subject first attracted the attention of Colonel Biddulph, Commissioner, Ajmer-Merwara, in 1892. A list of roads was made out and measures taken to start the work. Owing to the failure of the rains no practical action was however taken. In July 1893 Mr. Martindale, who had succeeded Colonel Biddulph as Commissioner, convened a special meeting of District Officers to consider the best way of improving roadside arboriculture. The Forest Officer was a Member of this Committee. It was decided to place the whole of the avenues under the Forest Officer, who would annually plant a certain length of roads, radiating from the principal centres—Ajmer, Beawar, Nasirabad, Kekri, etc.,—according as funds became available.

The following general instructions were issued :—Plants to be 3' in height (subsequently raised to 4') ; distance between plants 30', giving 352 trees to a mile ; best tree to plant was *shisham* (*Dalbergia latifolia*), then in order *nim* (*Melia indica*), *bar* (*Ficus bengalensis*), *jamam* (*Eugenia operculata*), and *babul* (*Acacia arabica*) ; the plants to be obtained from the Forest nurseries and paid for ; a scheme of operations to be drawn up annually and submitted for sanction ; funds to be allotted annually to the Forest Officer, on requisition, up to limit available.

Work was commenced on the above lines and continued up to 1898. A number of difficulties cropped up over the watering of the young plants, species being planted on the wrong soils, insufficient protection from traffic and cattle, indiscriminate use of plants of all sizes, etc., and these defects became so serious that in 1898, at the instance of the Forest Officer, the Commissioner suspended all planting for a year. The whole system was then revised, and great success is said to have attended the plantations undertaken since 1899-1900. Under the existing arrangements the amount of new planting is determined by the funds available after providing for the maintenance of the existing plantations, a yearly annual plan of operations being drawn up. The transplants are at least 4' high and not less than two years old ; the distance between the plants is 50', thus giving 210 trees to a mile ; the

best avenue trees have been found to be *nim* and *kalia siris* (*Albizzia odoratissima*). These suit all kinds of soil and are not attacked by white-ants. In *reh* soils tamarisk is most suitable and for loose sandy soils, *shisham* and *arusa* (*Adhatoda Vasica*). *Ficus* cuttings were tried in the past, but died in large numbers. The trees are planted at the beginning of the rains. If these latter do not fail and the plants are well protected and regularly watered, they will be completely established within five to seven years. All the avenues after the famine of 1899-1900 have been planted on the lines above indicated and are in a very flourishing condition.

The great difficulty to be faced in roadside avenue planting is the question of an efficient tree-guard. The experience gained in Ajmer-Merwara shows that (1) For ordinary purposes wood enclosures made of 4 uprights 5' high with 3 cross pieces of wood 1½' apart interwoven with thorns, total costing annas 8, are sufficient. (2) In the vicinity of towns and big villages enclosures of dry stone masonry or of *katcha* bricks plastered with clay and a coping of morum are used. They are 4' high, 1' thick, with a diameter of 4'. They cost Re. 1-3-0 each. Blanks are at once filled up.

We see in the existing system in Ajmer-Merwara the results of eleven years' experience, and the present methods and attention paid to this extremely important matter appear to be commendably thorough.

In the case of roadside arboriculture one point should not be lost sight of, and that is that the expenditure to be incurred is not an endless reoccurring one. Once the roads have been planted up and the young trees have established themselves, the expenditure on further planting and maintenance drops out of the budget.

We trust that the action taken by the Government of India will result in restoring to the old roads and giving to the new ones of the country those fine avenues, now fast disappearing, which we inherit and enjoy owing to the far-sighted policy of earlier British Administrations in the country.

* 'TREES.' VOLUME I—BUDS AND TWIGS.

BY H. MARSHALL WARD, SC.D., F.R.S.

This work will form a valuable addition to the library of anyone who is interested in the fascinating study of nature as revealed by a first-hand acquaintance with the living plant in its natural state. It is the first of a series of volumes whose purpose is to provide students of Forest Botany with a guide to the study of trees and shrubs from the point of view of the out-door naturalist, while at the same time interesting them in a somewhat closer examination in the laboratory of the objects observed out of doors. This volume ably fulfils its purpose, and will afford a refreshing stimulus to the student to observe and think for himself.

The work is divided into two Parts—I, General, and II, Special. In Part I, the author deals comprehensively with the shoot system and its differentiated parts, describing in turn, with numerous examples, buds, their position, arrangement and structure; bud-scales, the arrangement of leaves in the bud, the opening of the bud and extension of the shoot, different kinds of shoots, the tegumentary system—epidermis and its outgrowths, and periderm (cork)—leaf-casting and the formation of leaf-scars, twigs, lenticels, and finally certain accessory characters of twigs (hairs, bristles, prickles, spines, tendrils, etc). Part II is of a more special nature, and consists of a classification of the trees and shrubs commonly met with in England, according to the characteristics exhibited by their buds and twigs. Even to merely outline the system would be beyond the scope of this review; suffice it to say that the classification has been most carefully worked out and the arrangement is clear and concise, the language being free from unnecessary technicalities.

The book is admirably illustrated throughout. Some of the illustrations have appeared elsewhere, but a large number are new; they form an indispensable adjunct to the text.

* 'Trees,' a Handbook of Forest Botany for the Woodlands and the Laboratory, by H. Marshall Ward, Sc.D., F.R.S., Volume I—Buds and Twigs. Cambridge Biological Series, Cambridge, at the University Press, 1904. Price 4s. 6d.

We may conclude by quoting a passage from the author's Preface in support of the plea that the branch of study revealed to us in the present work is no mere amateur's hobby, but may be profitably pursued by the expert: "Rarely have I experienced a greater surprise, or enjoyed days of field-work more, than during a fortunate visit many years ago to one of the greatest Forest Botanists ever known to Europe: he could recognize practically every species of tree, shrub, or bush we met with, from the smallest piece of twig with one or two internodes on it, or from a mere fragment of its wood or bark or leaf, and if anyone is inclined to regard such knowledge as barren, let him look into the work that Robert Hartig accomplished during his lifetime."

SHIKAR, TRAVEL AND NATURAL HISTORY NOTES.

A VISIT TO MAURITIUS.

(Continued from p. 223, Vol. xxx.)

In a former article I gave some account of Mauritius. Amongst other idiosyncracies the Colony has a most peculiar system of weights and measures, yet, strange to say, whenever Nature vouchsafes her a good crop and abstains from disasters Mauritius does not fail to wax fat, irrespective of her peculiarity in this respect. The ton, cwt., pound, kilogramme, and apothecary's weight are all used. Sugar may be grown in tons of cane to the acre, squeezed by the 1,000 kilos. of cane, sold by the 100 lbs. of crystals, transported by the railway ton weight, and shipped by the ship's ton measure. Land is measured by the acre and by the arpent, the ratio being 43'45, but surveying is done with a chain of 100 French feet, the latter being slightly larger than the English foot. Maps are drawn to the scale of generally 2,000 French feet to the French inch, but English-made maps are mostly in English inches and miles. The relationship between two such maps of the same land is by no means obvious to the non-professional. There are other obsolete



Photo, F. Gleadow.

Sideroxylon Grandi Florum (?) ("Tamalacoque"). Girth 17 ft. (Mauritius).



measures quite in keeping with the obsolete English ones of which metric agitators make so much capital. The legal coinage is the rupee divided into cents, but there is a collateral theoretical coinage which has no visible means of existence, yet is used every day. This is the *piastre* divided into *centièmes*. The piastre replaced the obsolete dollar in the hearts of the people. Mauritius has at times been so rich that nothing less than a dollar was good enough to throw about, and to this day you can bet in dollars or piastres and pay at the rate of two rupees. An auction is a confusing function at first. The auctioneer speaks English, his clerk French, and they simultaneously shout the last bid in the two different coinages. Thus while the auctioneer is bellowing "fifty-two, fifty-three, fifty-three rupees and a half" the clerk bawls "vingt six piastres, vingt six et demie, vingt six piastres soixante quinze centièmes," and so on. As they frequently pronounce *piastre* like *piasse*, the greenhorn is liable to hear *pièce*, fancy a *pièce* is a rupee, and pay just double what he intended. The two-cent piece is called a *cash* and is thus one *centième* or the hundredth part of a dollar or piastre.

The cloth-sellers prefer to sell by the ell or *aune*, but they keep a metre measure, which they reduce by so much for the yard, and increase by so much for the ell. Timber is sold by the foot cube, English or French, and by the foot run, English or French, according as it is home-grown or imported, but never by the metre. Fire wood is sold by the cord, or stack of $2\frac{1}{2} \times 4 \times 8 = 80$ French cubic feet. Charcoal is sold by the sack, and the sack is measured not in cubic feet but in kerosene tins, a new standard that has not yet been legalised.

Labour is paid much more than in India, no rank in life getting less pay than fifteen or twenty rupees a month, while dock-labourers during the season can command three or four rupees a day. The mass of agricultural labour is Indian, but there are large numbers of negro creoles and mixed races. The negro keeps off the land as a rule, his ancestors having had enough of it, and his class considering it rather a degrading occupation unless he is himself the owner.

The Negro in all countries is built that way. He would rather stroll round as a gamekeeper with a gun, poach regularly, pilfer as regularly, and get roysterous whenever liquor is available, than do any form of steady labour. Both Negroes and Indians will work most pluckily on exceptional occasions, such as getting in the crop against time, or accumulating a big week's wages for a heavy New Year orgie. They will in such weeks do three to four times the normal amount of work, and the negro element especially will spend every farthing of the wages on debauchery. Many of them drink all they earn, leaving the wife to maintain the house.

The climate of Mauritius varies with circumstances. If you have standing wood to sell, the climate is far too moist ; but if it is your neighbour who proposes to cut his forest, the climate is desperately dry and the country in danger of being ruined by the drying up of its streams. As a matter of fact, the streams throughout have seriously diminished and the climate is not nearly so moist as it used to be ; but it differs considerably according to localities. On the East Coast the rainfall is heavy, on the West it is light. On the slopes of the Bamboo range it is said to reach 200 inches, whilst the West Coast in some years only gets about 12 to 20 inches. Curepipe, the highest town, situate about the centre of the Island, is a place where books are ruined, clothes always damp and boots go mouldy. The houses are mostly wood and have no fireplaces, but the damp is sometimes cold and raw in the winter months, May to July. Port Louis, the capital, is on the West Coast, habitable in winter, but steamy and feverish in the summer—in fact a climate similar to that of Bombay. It is about as far south of the equator as Bombay is north, and is consequently cooler, but is so little desirable as a residence that it resembles the City of London in the crowds that enter and leave it by train morning and evening, while at night the poor are almost its sole population.

The forest system is rather complicated. Besides private forests proper and Crown forests there are three other classes of land generally devoted to forests, and of these three two may sometimes belong to private persons while the third is often leased

to them. In the beginning the whole of the soil belonged to the Government, which gave or sold grants of land. The principal conditions attaching to these concessions were—

- (a) the clearing and cultivating of the land ;
- (b) permanent residence of the owner ;
- (c) maintenance of a fourth or fifth of the area under forest ;
- (d) maintenance of the upper third or two-thirds of all mountains under forest ;
- (e) maintenance of a belt varying from 50 to 100 feet along both banks of streams ;
- (f) maintenance of a belt called the " Pas géométriques " (50 " steps " of 6 feet !) all round the Coast for military purposes ;
- (g) education of all slaves as Christians ;
- (h) slaves not to work on holidays and Saints days ;
- (i) labour to be provided for road-mending or other public purposes at the rate of two days in the year per slave ;
- (j) payment of a nominal rent, perhaps an ounce of coffee and a fowl or two per acre per annum.

It results from clauses (c), (d), (e), and (f) that as the extent of the legal grant was $156\frac{1}{4}$ or $312\frac{1}{2}$ arpents almost every land-owner in the Island ought to have had some area of forest which he was obliged to conserve in the interests of the Colony at large. The conditions were grossly and continually disregarded, but that does not affect the principle, and the classes still exist. The Government forests thus comprise Crown forests proper, Pas géométriques, River Reserves and Mountain Reserves. The last two, being for the common benefit of the Colony, are not available for fellings, grazing, etc., but only in general for shooting and fishing. The Pas géométriques are almost entirely leased to private persons for purposes of plantation, grazing, bathing, residence or agriculture, notwithstanding that the law has always forbidden the last two, but a law is no good if it is not enforced. The Crown forests proper are of two kinds, the old original forests that have been more or less plundered or utterly ruined, as the case may be, and the lands that have been bought back from private owners during

the last twenty years or so. These last lands are sometimes good forest, but in most cases they had been cleared and perhaps cultivated by the owners, so that they now largely consist of wretched open scrub. The *Pas géométriques* were originally a military zone to allow of rapid transit between the numerous batteries round the Coast, and to provide some grazing for transport animals. At that time wood was a drug in the market, not to say a nuisance, yet the *Pas géométriques* were not to be cleared, and they were declared imprescriptible. Later, it was distinctly laid down that they were to be kept planted whenever they became bare. Notwithstanding strict and repeated laws, persons of influence continued to obtain grants or formal recognitions of prescriptive rights for themselves or their hangers-on. Latterly a new law has been passed which gets round the old law of imprescriptibility by means of declaring parts of the *Pas géométriques* to be "extended villages." As such, they may be cleared, inhabited, cultivated, or otherwise disposed of like any waste land.

The private forests comprise Mountain and River Reserves, besides those which the owners may do as they like with free from any restraint. Mountain and River Reserves are a property subject to a heavy servitude. They belong entirely to the owner, soil and trees, but he may not cut a tree or a branch without first obtaining special permission. His enjoyment is thus practically limited to the chase, with very rarely the permission to utilise a dead or broken tree. There has recently been a proposal to enlarge the privileges of the owners by letting them work their mountain and river reserves regularly under the supervision of the Forest Department. It is perhaps hard that they should be so limited, but they have only themselves to blame. They have no right to claim any more indulgence than is sanctioned by existing practice, and after seeing the moral tone of the public service and of the people from which it is drawn, I have no hesitation in saying that any such concession would only be regarded as a facility for further abuses. The State must eventually acquire those Mountain Reserves that now belong to private owners, and it would be most injudicious to alter anything in the meanwhile.





Photo, F. Gleadon.

The Camizard Mountain (columnar basalt) Forest and Sugarcane, Mauritius (telephoto view).

As regards private River Reserves it is very difficult to know what to do. They are surrounded by crowds of pilfering coolies, and many of the estates do all in their power by fair or foul means to reduce them. The width of the forest strip along streams is fixed by law at 10, 25, or 50 feet each side from the water's edge, according to the quantity of water flowing in them. Whenever a dry year, etc., offers the opportunity the owners claim to have the flow measured, and often succeed in getting the legal width reduced. When the basin of a 50-foot stream is well cleared of forest growth the flow naturally diminishes, and the reserves are reduced to 25 feet. This reduction further diminishes the flow, and another opportunity occurs for remeasurement. The reserves are reduced to 10 feet, and that is about the end. Marshes, the natural protectors of streams, are drained and cultivated, so that for many years there has been a continual reduction in the flow of all the streams in the Island, and many mills have had to close for want of water for their machinery. Estates are being cut up into innumerable small holdings of an acre or two, or even less, so that effective protection is becoming more difficult. It thus becomes an open question whether the State will be able to effectively preserve these strips, or whether they are bound to disappear in a future not very remote. In the latter case it might be advisable to sell the servitude to the owners at once, but such a sale would have to be compulsory, for though a few honest Estates would be glad to acquire and maintain them, the majority would prefer to destroy them gradually. In any case some would plead that their pecuniary position precluded them from buying their freedom. It is a thousand pities that the old law of 50 and 100 feet was not maintained, but it cannot be re-established. Another old law required owners to maintain the wooded state, but that too has been abolished, and the only existing remedy is to catch the offenders in the act of destruction. It might be possible to revive this last law and to require all owners to *plant and maintain* on penalty of a heavy fine. This would meet the case if duly enforced, but I doubt if the Forest Department would dare enforce it. Just before I left I heard

that an Estate in which a member of Council is strongly interested had been defying the law, but nobody dared to interfere. A large proportion of the forest guards have no other work but patrolling these private reserves. It is a very heavy burden on the Department and a continual temptation to the guards, who cannot afford to be on bad terms with Estate-owners. No revenue is derived from River Reserves, and they are a school for dishonesty, but they certainly benefit the Colony, and I did not see my way to recommend their abolition.

Barring the Pas géométriques and a few exceptional cases there is no grazing in the forests, whether Crown or private, but the fishing and shooting are strictly preserved, and as diligently poached. The less said about the river sport the better, as it consists principally of noosing prawns; but the shooting is good. The forests contain numbers of a kind of deer resembling a half-grown sambhar or bigger. Stalking is generally impossible on account of the dense mass of raspberries and lantana, so the method adopted is the battue. A few narrow paths are cut for the keepers, and dogs are put in. The owner has invited a large party, who are stationed at intervals, and the game is driven past. There are game laws for a close season, etc., but the owners are the first to break them, and it is notorious that venison is a standing dish at Xmas and New Year, in the middle of the close season. The battue may begin at 5 A.M., and the guests sit sometimes for hours in pouring rain without perhaps getting a shot, but that is a secondary consideration. The real pleasure begins with the dinner and the jovial evening that follows. Stalking is only practised in the rutting season, when the stags are calling. It is looked on generally with disapproval, not because it is unsportsman-like, but because it is supposed to drive away the deer to other pastures much quicker than the battue does; also no doubt because there is no social gaiety about it. The sporting rights in forests are leased for periods of seven years, but certain men often manage to keep out competitors for as long as they live, either by *camaraderie* or (if there is no public path) by preventing access to the land. The State revenue from sporting rights perhaps averages Rs. 5,000 a year.

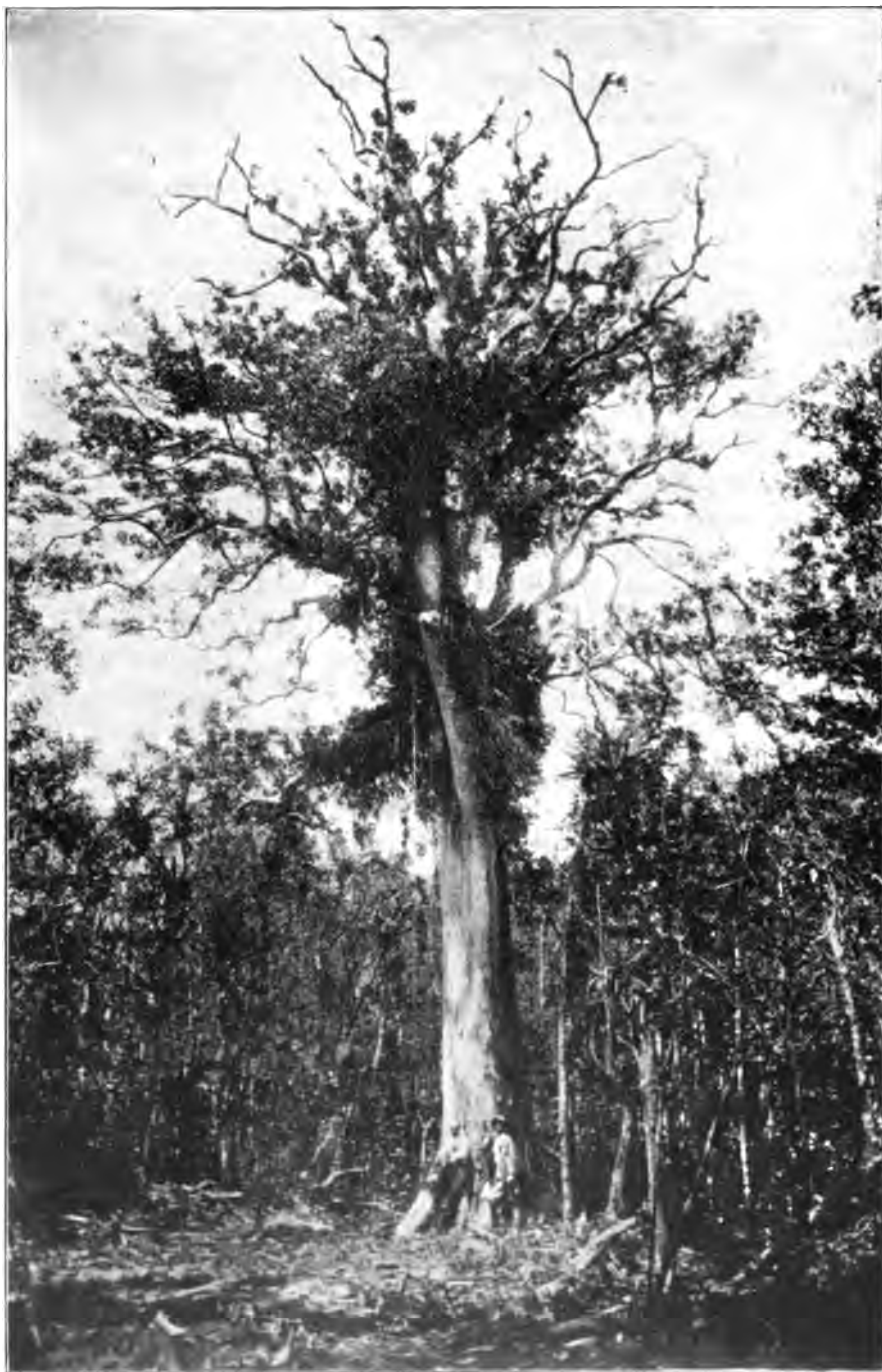
The contrast between these forests and the burnt and overgrazed jungles of, *e.g.*, Bombay, is most striking, the one being full of fine young seedlings, the other merely hanging on to life. Even in Mauritius there are grave examples of areas that were forest within living memory but which have now become too dry to be planted with much hope of success.

The old provisions, requiring the maintenance of a fourth or fifth of the area under forest, and of the upper slopes of all mountains, were dictated by true regard for the interests of the Colony. Unfortunately, there was no adequate agency to carry them out, no proper penalties for disobedience, and if there had been, the community was so addicted to "*camaraderie*" from the highest to the lowest that no restrictive law had any chance of success unless its operation was strictly controlled from home. This control was wanting. The home Government was continually fulminating against the disregard of laws and enacting new ones, but evasions increased to a frightful extent. Another law was made which contained definitions of an absolutely unworkable nature. The Surveyor-General failed to insist on having a law that could be carried out, and chaos supervened. Mountain Reserves and even State forests were cleared with cynical effrontery and with impunity by neighbouring landowners and others. Prescriptive claims to Crown lands were set up and successfully maintained. Government Surveyors were bribed to make over State lands. Mountains were cultivated right over their tops. Stolen lands were sold to second and third parties, so that they could not be resumed without apparent injustice. Those who had robbed most were loudest in their outcries against the injustice of a Government that desired to protect the State property, and they succeeded in paralysing all such efforts. For the last twenty years or so this state of paralysis has continued, so that men who ought to have been very heavily fined or imprisoned have either become practically confirmed in the ownership, or they have sold the stolen lands to others who claim to have bought in good faith. In any case the State has been looted to a shameful extent both in land and in timber. Forests that should have provided large revenues for the next fifty or a

hundred years have been swept in to the pockets of robbers or destroyed deliberately to make room for crops. Much of the land so cleared was found incapable of profitable culture, and now lies nearly bare. In some cases the persons who have plundered the State have sold the land back to Government at high prices or are now attempting to do so. The responsibility for this sad condition of things lies at the door of—whom? The Government can do but little unless a Council will approve a draft law, and that is just what broke down. Suffice it to say that things would have been far worse but for one man, Sir Célicourt Antelme, who did his utmost to insist on honesty regardless of *camaraderie* or other considerations.

The local Forest Department dates back to very early times, but was very small and inefficient until the last reorganisation. It consists of a Director of Forests and Gardens (the Botanical Gardens at Pamplémousses are very fine indeed), two Assistants, eight Inspectors, and about a hundred Forest Guards. Perhaps a third of these guards could be dispensed with if the River Reserves were abolished, as they do nothing but patrol the banks of private streams, but actually I have proposed to increase their number to 134. There is of course a separate office and gardening staff. The Director is paid Rs. 5,000 a year, and the Guards begin on Rs. 15 and 20 a month, which is looked upon as a starvation wage. A few get quarters, but the rest have to hire for themselves. The pay of the Director I wished to raise very considerably, but they seem to have decided that Rs. 6,000 to 8,000 is the most they can pay. Seeing the difficult position that any local Director finds himself placed in, and the practical certainty that he must succumb to local influences when his children have to look to those influences for their prospects, I strongly recommended that the Director should be a stranger to the Colony, but here again local influences seem to be too strong. My recommendation was that Mauritius should be for forest purposes practically attached to India. The Indian establishment would be enlarged by one post, the Mauritius Government would defray the cost, and the Inspector-General would depute a suitable





Photo, F. Gladow.

Canarium Colophania ("Colophane"). Girth 16 ft. (Mauritius).

Assistant Conservator, 1st grade, or Deputy Conservator, 4th grade, for three to five years or until his promotion brought him more pay than Mauritius was contributing. It would be useful experience for India, Mauritius cannot do better for herself, and there is no real reason that I can see for rejecting the plan.

One rather curious thing in the Mauritius system is the idea of paying a man extra when he really does his work. Of course, if an officer devotes his leisure to writing some useful technical book, etc., it is only fair that he should be rewarded. But in Mauritius almost anything beyond the usual casual routine may be made a ground for extra pay. Thus a Forest Inspector who has a felling going on in his charge may get Rs. 150 a month extra pay and Rs. 60 a month extra horse allowance, although the hours he devotes to the felling are simply subtracted from patrolling or other work. It is the same in all Departments. The extra work of course involves more trouble and responsibility, but after all it is the work for which the officer is paid. The system should be stopped, but Inspectors should also be better paid all round, for their present pay is insufficient to secure the best men.

The illustrations show a telephoto view of the Camizard Mountain which consists of columnar basalt and of specimens of *Sideroxylon grandiflorum*(?), known as 'tamalacoque' and *Canarium colophania*, known as 'colophane' in the Island. The trees depicted girth 17ft. and 16ft. respectively at 6ft. from the ground and have their big branches densely overgrown with *Asplenium nidus* and other ferns ; so thick is this arboreal vegetation that a man could easily conceal himself within it.

F. G.

EXTRACTS FROM OFFICIAL PAPERS.

NOTE ON GERMINATION OF TEAK AND OTHER SEEDS.*

I. - TEAK.

1. Teak seed, if not previously prepared, germinate best in the second year after falling from the tree. The result of this feature in the germinating power of teak seed is that double sets of seed beds are required in a nursery, which involves loss of area and extra expense in keeping the beds clear of weed, etc.

2. As the area of the Godhra Forest nursery is limited, it has been found necessary to determine the best method of forcing teak seed, and to do this the seed has been forced by three different methods and the result carefully examined.

3. The first method, under which a large quantity of seed was treated, consisted in laying out the seed in a thin layer on a gravel path and exposing it to the heat of the sun for over two months, the seed being turned every fortnight, so as to expose all sides to the heat. Before the rains set in the seed was sown on raised seed beds, previously prepared, as described at the end of this note. This method was suggested by Mr. Damle, Extra Assistant Conservator of Forests, Nasik, and will be referred to later as Damle's method, No. I.

4. The second method which was tried consisted of putting teak seed in layers about one inch thick in a pit 10 feet square and 18 inches to 2 feet deep with alternate layers of earth of the same thickness. The whole was filled level with the ground, with alternate layers of seed and earth, and then flooded with water every other day, five times. The whole mass was then thoroughly mixed and again watered on alternate days, until the seed showed signs of germination. This method may be called for reference "The Modified Burman method, No. II."

5. The third method consisted of putting teak seed in pits, 4 feet square and 2 feet deep, flooding the whole for four days

* This note was very kindly placed at the disposal of the Hon. Editor by the Conservator of Forests, Northern Circle, Bombay.

and drying the seed on paths for four days by spreading it out in thin layers and repeating the process until the seed showed signs of germination. This may be called the "Local method No. III."

6. The seed used in these experiments was collected in the Panch Mahals, and is therefore local seed. Five hundred pounds or over were treated by each method and 1,000 seeds of each kind were carefully selected and sown in separate raised beds, for the purpose of estimating the relative value of each method.

7. The results observed are as follows:—

(a). All three sets of 1,000 seed were sown on the 4th June 1904.

(b). Rain fell 2 inches and 17 cents on 11th June 1904.

Do. 0 do. 29 do. 21st do.

Do. 0 do. 19 do. 4th July

Do. 1 do. 87 do. 5th do.

Do. 1 do. 43 do. 7th do.

Do. 1 do. 58 do. 11th do.

(c). On the 21st June 1904 one teak seed germinated out of the 1,000 treated, under the Local method No. III (the beds containing seed treated under observation, also showed plentiful signs of germination on this date, but not those treated under Nos. I or II).

(d). On the 8th July 1904 all three sets of seed showed signs of germination.

8. After this period the number of seeds which had germinated in each set of beds, containing 1,000 seeds each, were counted, giving the following results:—

Date.	Damle's method No. I No. of seed germinated	Modified Burman method No. II. No. of seed germinated.	Local method No. III. No. of seed germinated.
22nd July 1904 ...	65	312	22
29th " ...	99	335	27
20th August 1904	100	313*	27

* Some plants killed by a cockchafer grub.

9. The beds which were not under observation but sown with the three differently prepared kinds of seed show similar results to the above, except that the difference in the methods Nos. II and III was not quite so marked as in the experimental beds. No. III germinated first both in the common beds and experimental beds. All the beds of seed treated under method No. II gave most excellent results, and roughly 60,000 to 70,000 plants were obtained out of 500 lbs. of seed treated under this method.

II. KHAIR SEED.

10. Khair seed requires no previous preparation, but germinates readily after a moderate rainfall. It should, however, be sown in raised beds, as excessive moisture rots the seed. Last year 15 bags of khair seed were lost by heavy rain falling on it. This year, to avoid similar failure, the seed was sown and watered by hand ten days before the break of the monsoon. It germinated on the 4th day; on the 10th day after sowing heavy rain fell which, had it not been made to germinate by forcing it previous to the heavy fall of rain, would probably have destroyed it.

III.—AIN (*Terminalia tomentosa*).

11. Ain is sown on a layer of leaves and grass so as to raise it from the ground to prevent it becoming rotten and spoilt by rain. It germinates readily after a good rainfall, and is easy to lift without damage to its root if sown on leaves.

IV.—BIA.

12. Sown in a similar manner to ain without preparation.

V.—DHAWDA (*Anogeissus latifolia*).

13. No good results have as yet been obtained from Dhawda sowings. Sowing on both heavy and sandy soil has failed. The best results, which are at best no good, have been obtained by soaking it for 24 hours in warm water. It, however, transplants easily when once up and with little loss.

PREPARATION OF SEED BEDS.

14. Mr. Damle advised digging or ploughing up the ground for the proposed seed beds in January, so as to expose the soil during the hot weather to climatic influences. This was done in the nursery and the raised seed beds prepared,

at the end of May, with excellent results. Raised seed beds are preferable to sunk beds, though the latter have to be used in the case of transplant beds where watering is done by irrigation.

R. S. PEARSON,
Divisional Forest Officer,
Panch Mahals.

MISCELLANEA.

AUSTRALIAN FORESTRY

COMMUNICATED BY J. PLUMMER.

The importance of forest conservation is beginning to receive increased attention in the Commonwealth, where the revenue from the various State forest lands remains considerably below that obtained in countries possessing far less wealth of timber. In New South Wales the forests, contrary to the popular idea in Europe and America, extend over almost the whole area of the State, excepting portions of the Monaro, Lachlan, Murrumbidgee districts, and the trans-Darling region, where extensive treeless plains occur clothed with salt-bush, scrub, or species of natural grasses. There are at the present time nearly six and a half million acres of forest reserves in the State. In South Australia there are nearly 200,000 acres of forest reserves and plantations; in Queensland, where forest conservation is of recent date, the reserved areas form a total of over three million acres; in Victoria the forest reserves cover a total area of 4,679,540 acres out of 11,797,000 acres of forest country, the balance being mostly timber country difficult of access; in Western Australia a beginning has been made by establishing forest reserves forming a total of over a million acres out of an estimated total of 20,000,000 acres; while in Tasmania about 33,300 acres have been reserved for timber-planting and growing. The total area of forest land in the latter State is about 4,000,000 acres, and it has been estimated that the forest lands of the Commonwealth cover an area of over 60,000,000

acres. The trees met with are chiefly species of *Eucalyptus*, *Angophora*, and other genera of the order *Myrtaceæ*. The prevalence of the eucalypti, and the large extent covered by the forests, give the country a rather monotonous aspect; but the park-like appearance of the open forests and the beauty of many flowering shrubs win admiration in spite of the sameness of the trees; while even the dull, greyish blue of the foliage of the gum trees, when relieved by the yellow blossoms of the wattle, including the graceful myall, or the beautiful and shapely kurrajong, is not without its attractiveness. The trees are, for the most part, straight and cylindrical in the trunk, and when full grown, their first branch is at a considerable height from the ground. The roots of the eucalyptus often lie at no great distance from the surface soil, an adaptation of nature to the peculiar climatic conditions of the country. The finest specimens of many of the timber trees, those yielding the most valuable timber, are found on ridges and hill sides, in places frequently too rough and stony for cultivation. In Western Australia the most valuable indigenous timbers are the jarrah, twart (or torart), sandal wood, karri, and several others. In Queensland cedar timbers are abundant; also in the northern portions of New South Wales, some of the logs obtained being of enormous size. One characteristic feature of Australian hard wood trees, of which there exists an almost endless variety, is the great size of the beams which may be obtained from them, as well as for the extreme toughness and durability of their wood; the grey ironbark having a resistance to breaking equal to 17,900 lb. per square inch, as compared with a mean of 11,800 lb. for English oak and 15,500 for teak. None of the other timbers have so high a resistance to breaking as this description of ironbark, but nearly all the varieties have a greater strength than oak. The quality of the wood is materially influenced by the soil on which the trees grow, while the absence of branches for the greater portion of the height enables the timber to be obtained to the best advantage; and as full-grown trees of most varieties are rarely less than 100 feet high, with corresponding girth, the quantity of timber obtainable from the virgin forests is very large. In New

South Wales the timbers of commercial value, many of which are found in the other States, include white or she-ironbark, narrow-leaved ironbark, broad-leaved ironbark, mugga, or red ironbark, blackbutt, white mahogany, tallow-wood, spotted gum, grey box, red mahogany, grey gum, forest red gum, Sydney blue gum, and turpentine, the latter resisting the attacks of white ants. One of the most useful trees is the red cedar, the wood of which, somewhat resembling mahogany, is well adapted for the finer kinds of cabinet-makers' work. Some of the cedar trees grow to immense size, as much as 2,500 cubic feet of valuable timber having been obtained from a single tree. Many of the woods of the minor trees are beautifully grained, and capable of receiving the highest polish, while others are fragrantly perfumed. These woods are adapted to the finest description of cabinet-making, and it is strange that their merits should have so long escaped attention. Amongst these trees may be mentioned the rosewood, tulipwood, yellowwood, white maple, white beech, myall, marblewood, mock orange, and many others. Besides their use for cabinet-making, many of the brush timbers are of great utility for the rougher kinds of carpentry; while some, both hard and soft woods, are admirably adapted for coachbuilders' and coopers' work. "Colonial deal" is an excellent timber, and is obtained in very large scantling, the tree frequently reaching 120 feet in height. It is soft, close-grained, easily wrought, and remarkably free from knots. Its use therefore is extensive for cabinet-makers' work and house fittings. The value of the exports of Australian timber, dressed and undressed, from Commonwealth ports in 1903 was £745,490, of which the undressed timber, chiefly from Western Australia, represented £739,317.

NEW SOUTH WALES HARDWOODS FOR STREET PAVEMENT.

The question of a proper material for road-making and street pavement is one which every large Municipality in India has seriously to consider. The introduction of electric traction has,

in a great measure, revolutionised the conditions in cities which had already begun to feel the strain of a heavy horse and cart traffic consequent on an increasing prosperity, an increasing population and, yea, an increasing luxury. The lotus-eating days are over. The days of the soft pad of the elephant and the camel and of the slowly moving cumbersome wain are gone. Life, be it spent in the pursuit of commerce or mere luxury, is strenuous and locomotion is useless unless maintained at high speed. It is necessary to state the obvious in dealing with a matter which has puzzled Engineers who have been successful in solving intricate problems of drainage and water-supply. During the *régime* of Mr. M. C. Murzban, who may perhaps be accepted as the greatest expert in India in street roads, Bombay had probably the best streets in India. There was a plentiful supply of good material at hand and labour was cheap and intelligent. Yet we find Bombay now dissatisfied, and experiments are in train to treat the principal roads with oil and tar, to prevent the dust resulting from abnormal wear and tear. In Madras they are also in trouble with their roads, the worst perhaps in all the capitals; and in Calcutta there are loud cries of the failure of moorum. In considering the whole subject, we have been struck by a deficiency which, to say the least, is remarkable. In many large cities of the world outside India wood is largely used with success for street paving; but it does not appear to have entered the heads of any of the larger Municipalities in India to adopt a means as old as civilisation but as effective as ever. The Howrah Bridge, at Calcutta, over which there passes a traffic in volume and weight second only to that of London Bridge, is floored with wooden battens, and they have proved so economical and enduring that the wonder is that all the approaches to the Bridge are not treated with like material in the form of wooden blocks. Wood, as a paving material, is comfortable, sanitary and decent, and, after the initial cost has been overcome, much more economical than any other material. In the great and beautiful city of Calcutta wood-paved streets would be a boon to the Municipality and a blessing to the inhabitants. Life in the large thoroughfares



like Chowringhee, Dhurumtollah, Old Court House Street, and Bentinck Street has been made hideous by the jangle of the electric cars, the rattling of gharries over the rough ill-cut cobbles with which the tramway track is paved, and the vibration of all this heavy traffic. During the hot weather, when the wind is high, people are blinded by dust. When it rains, or the streets are watered from the public hydrants, the road material forms a clayey puddle and a danger to the pedestrian, to the cyclist, and the horseman. From whatever point of view, therefore, the present conditions are unsatisfactory and should not be allowed to continue when there is a satisfactory solution of the difficulty at hand.

Having decided to experiment with wood, the next point to consider is the species to be employed, and there appears little doubt that the hardwoods of Australia, and particularly those of New South Wales, which can be procured in abundance at a rate impossible for even the produce of our own forests, are the best. They have stood the test of experiment; and it may be interesting to mention that in Colombo, where the climate in summer differs little from that of Calcutta, and the mode of life is much the same, the Public Works Department are strong advocates for wood paving. It has been found by experience both in Australia and England that the Australian hardwoods wear better than pine or plain deal, and are more hygienic from the fact that they are less absorbent than soft woods, and do not easily become greasy. Even when laid in connection with electric tramways, it was found that the wear of these woods against the rails was better than other woods, was clean, noiseless, easily scavenged, and gave no trouble from expansion. Anything more ideal could hardly be wanted for Calcutta, where the electric cars have brought nothing but trouble in their wake.

In Australia, the testimony to the value of wood paving is very high. The climatic conditions there are not unlike those in India. They have sudden and great changes of temperature. In summer the atmosphere is hot and dry, and during the rains the humidity is heavy. Nothing could be more trying to a woodpaved

road, yet the City Surveyor of Sydney says that making full allowance for depreciation and contingencies the minimum life of wood pavements may safely be considered as about fifteen years. Mr. MacCabe, the Calcutta Corporation Engineer, whose life has been made miserable by moorum, will probably rub his eyes and never be happy till he gets Blackbutt, Blue Gum, or Red Mahogany for his main roads. In New York they have found such answer well, for, as one Engineer expresses it, "it is not a case of preserving wood, but of wood preserving itself."

As the question of cost is likely to frighten Indian Municipalities who have an exaggerated notion of the expensiveness of wood, we may at once say that comparisons between the cost of hardwoods and macadam show materially in favour of the former. The annual expenditure for repairs during the lifetime of a pavement must necessarily be a variable item, although it must obviously be less for hardwood than for macadam, which so readily crumbles. In addition to this there is the considerable advantage, especially in busy carriage ways, of the thoroughfare being less frequently closed for renewals, which is a matter of great importance to business-people, shop-keepers and others.

In the matter of hygiene there can be no question of the superiority of the timber roadways. They are less absorbent than stone-metal and do not soak up the sewage of the streets. Given therefore ordinarily good surface drainage in Calcutta, streets so paved should never become greasy and slippery and, on the other hand, never accumulate the particles of dust which are thrown up in the air to the destruction of our pulmonary tissues.

A series of observations made by the London police during fifty days in the busiest streets of the metropolis gave the following results:—1,066 horses fell on asphalte, 719 on granite, and 542 on wood. These results are confirmed by the well-known report of Colonel Haywood, formerly City of London Engineer, who stated that horses might be expected to travel 132 miles over granite, 191 over asphalte and 446 over wood, without accident. He also noticed that horses falling recovered their feet more easily on wood than on either asphalte or granite, and that

the accidents were much less serious. Wood is undoubtedly the material most approved by the public, whose demand for a noiseless pavement is not likely to be relaxed. Business is impossible and residence distressing in a busy street paved with material on which traffic produces a continuous clatter, like in Old Court House Street over the tramway cobbles. Wood or asphalt are the only materials which approach the ideal of a noiseless pavement, and between the two in that regard it is difficult to decide.

A. M. I.C.E.,
in *Indian Engineering*.

NEW WOODS.

Continuing our observations on the outlook for the development of the West African timber trade, after explaining how mahogany has commanded the premier position as a furniture wood, we must now consider what possibilities there may be for new and untried timbers.

We have shown that mahogany contains within itself possibly more attributes as a par-excellent material for furniture construction and for high-class fittings than any other wood ; the position has not been attained by a mere decree of fashion, but rather by its abundance and relative cheapness, combined with a beauty of appearance and a capacity for sustaining a high finish and polish. It is not too difficult to season nor to work ; further, when made up it is not liable to warp and twist ; another important factor in its favour is that its specific gravity is not extreme. What then are the conditions which must determine the successful introduction of strange woods ?

If they are only equal to those which they seek to supplant, they must, in the first place, be cheaper ; if they become supplementary they should be at once competitive ; in addition, there should be some reasonable guarantee as to the continuity of supplies. Thus pitch pine did not displace Danzig and Memel fir logs because its price was higher, but rather by its cheapness and better specification.

If a new wood has any special beauty of colour or figure, even if the price is higher, it may command a limited market, as the country is not overstocked with prodigal millionaires, and if any great consumption of any wood is to be stimulated, it can only arise from the requirements of the greater number who have only limited pockets.

We have, during a long course of years, taken every opportunity of carefully examining the many sample shipments of woods which from time to time have come forward; and it is surprising to find how few can compare with the recognised woods of the market. It might add force to our remarks were we tempted to name in detail the varieties in our mind, which fail in some way to fulfil the conditions requisite to secure their acceptance as a staple commodity, but we desire to avoid saying what might be detrimental to the interests of any, and our regret would be extreme if our remarks in any way tended to the damping of commercial enterprise, especially should they result in the prevention of the successful introduction of one wood with only half the attributes characteristic of mahogany. We therefore prefer to speak in a general sense to guide those who, whilst lacking any great expert knowledge of the various furniture woods available in this market, are in actual contact at some point of the globe with timber peculiar to the district.

At the outset, it may be permissible to say—that the mere fact that a tree attains to this or that size, does not prove that it contains good timber; were this so, horse chestnut, Sapeli wood, and jarrah, by their size alone, would at once become recognised furniture woods. We are further free to admit that many foreign woods may, at their point of growth, have a local value, either by the cheapness, or the absence of any competitive woods, and possibly they may serve the primitive requirements of the district, but the same wood shipped to this country, with all the incidental charges arising from transport, would not enter into competition with those already recognised. We are not sure that Mr. Weale's suggestion as to a representative collection of samples would solve the problem, for to judge woods in a

glass case would be like attempting to decide the merits of a stuffed bird as to its qualities as a food.

As to naming of timber and its proper classification, it is not so simple as Mr. Weale appears to think, and whilst we admit that the confusion in the nomenclature is puzzling to a degree, we fail to see a remedy.

The work of our international classification of timber is beyond the grasp of any committee of inspection—practical men lack the knowledge of the botanist, whilst the botanist lacks the practical experience to enable him to arrive at a decision that would be acceptable to all. Consider for one moment the part which local names play and must continue to play ; even Baltic fir is known in London as "yellow," whilst on the East Coast it is redwood. Then there is the question of coined or commercial names, such as "satin walnut" for a "gum," and "hazel pine" for the sapwood of "gumwood," and "bay poplar" for a species of "tupelo," and so we might multiply the list, but we have shown that a simple classification of timber is impossible. If the strange woods are to find a market, it will not be by the aid of museums, but they must be put on the market, bought and sold, and worked up for such purposes as they may be suitable, and experience will soon decide their utility, either for furniture woods, carriage construction, or engineering work, and if they are only good turnery wood they will find their level.

If for furniture, they must contain in a greater or less degree those virtues found in mahogany, not be of too great specific gravity, not too difficult to season, and yet possess a cohesiveness of fibre so that they do not unduly check and split, combined with beauty of colour and figure, and capable of taking a good polish.

If for carriage and wagon purposes, or for engineering work, they should possess the qualities of oak, strength and elasticity, and not be too heavy or potty. Each wood must be put in the market at prices to compete with those already recognised.

The lowness of price, combined with excellence of quality, is bound to stimulate consumption, but it must be apparent that it is not to the interest of cabinet-makers, architects, and engineers

to stipulate for unknown and untried woods, especially of those of which there is no guarantee for their continuity of supply.

We feel that at the moment there is not a good outlook for new woods, especially when we consider the present low prices of known woods—American oak planks below 2s., mahogany as low as 2¼ brokers' measure, but the world is moving rapidly, and with the revival of trade in the States and this country, we shall see an increased demand for woods of every description, so that the swing of the pendulum is bound to find room for woods which are at present despised.

Of this we are assured that every wood has its utility, and as known cuttings become depleted, or their values appreciated, so will woods, at present ignored, except at prices that are ruinous to the shippers, find in the near future an acceptable market.

Whilst it is desirable to see the area of supply enlarged, and the process of creating a demand continued, it is a pity to cut down to any extent standing timber, merely to be slaughtered.

Standing timber of every description has a value which of necessity we must appreciate, whilst felled or manufactured timber may be sold at prices that will not bring out freight and charges, and if stored, may eat itself away with interest and charges.

It should be recognised that the introduction of new woods must at the outset frequently result in loss to the shippers—especially in the present state of trade and depressed values all round; hence the greater need of discretion, coupled with a discernment to bring them forward at the crucial moment, when trade is good, and recognised woods are either scarce or dear.

In putting forward these suggestions we do not claim by any means to have exhausted the subject, and it should be noticed that it has been treated chiefly from the view of furniture woods and that of hardwoods in general, but without regard to small ornamental and turnery woods, and that no attempt has been made to trace the position and prospects of soft woods.—*Timber Trades Journal*.

ARTIFICIAL DRYING.—Wood drying by the hot air process is now practised somewhat extensively in Sweden, with the result that shipments arrive at discharging ports in much better condition

than formerly, to the satisfaction of both exporter and importer. It cannot be too strongly impressed upon shippers that allowance made for goods being out of condition seldom proves sufficient compensation to buyers, as, although the amount awarded is in many cases ample when only the strict conditions of contract are taken into account, it never makes good to a purchaser the annoyance and loss experienced in seeing his competitors move off their bright goods with facility, while his discoloured parcel is left on his hands to suffer, it may be, further deterioration. There are many exporters who fail to grasp the fact that, when once a deal or batten is thoroughly dry within, the damage done by a shower or two of rain is of no great consequence ; but if the wood retains only a small percentage of moisture, rain and damp weather will rapidly bring the fault to the surface, with disastrous results. It has been found again and again, and particularly this year, that goods which have been landed in bright condition, and apparently thoroughly seasoned, have slowly become mouldy when stored in the yards in close piles, particularly under shed in hot weather, and in places where there is no strong current of air. These annoyances are due solely to undetected moisture lurking within ; but, as far as experience goes, they might be easily obviated by the new system of artificial drying. We understand that the mills that have adopted this plan of seasoning their shipments find that the extra expense is more than balanced by the stoppage of claims on this side, to say nothing of the great gain in interest obtained through goods being ready for delivery months earlier than under the old system, and it would be interesting to the trade in general to have some statistics showing how these figures work out, particularly as to claims. It is somewhat singular that while several Scandinavian shippers were, as far as we know, the first to adopt this system, and while other exporters in Sweden and Norway are inclined to follow the example set, the Russian and Finnish exporters still stand aloof. Is their want of action owing to a disbelief in the efficacy of the process, or is it simply adherence to old-fashioned methods ? Another fact which further accounts for the better condition of Swedish goods is that covered

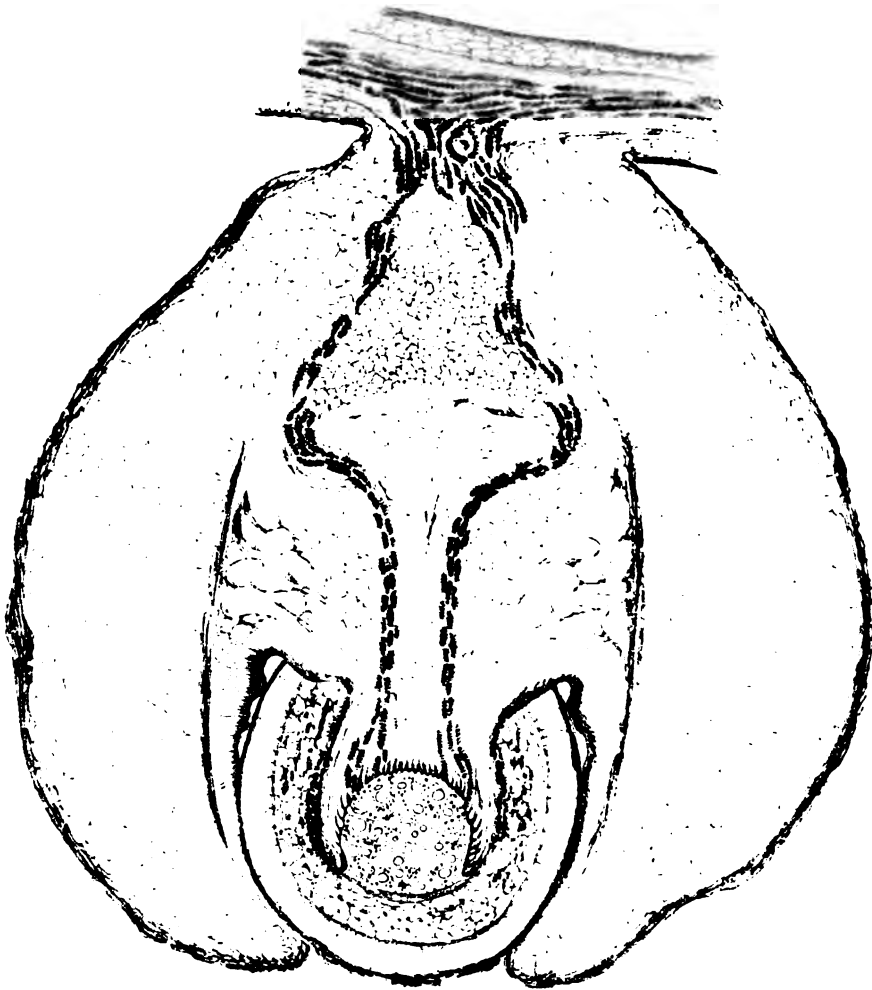
lighters are used much more extensively in Sweden and Norway than on the other side. The loss to many of the Russian shippers, especially at Cronstadt, through the deterioration suffered by goods owing to exposure to weather, coal dust, etc., must be very great, and should, we think, be easily obviated if energetic measures were taken to institute a better system.

ARBORICULTURE IN THE UNITED PROVINCES.—Considerable progress is being made in the extension of roadside avenues, though the heavy rains of 1903 damaged young trees in some districts. Private individuals have been encouraged to assist in planting avenues in various districts of the Agra, Rohilkhand, Allahabad, and Fyzabad divisions, and in the Fatehpur district no less than 21½ miles of avenues were planted in this manner.

WEBSTER'S FORESTERS' DIARY.*—Webster's Foresters' Diary for the year 1905 is now ready—and judging by the splendid reception accorded to the previous issues and the many suggestions received from recent purchasers, which have been embodied in the present issue, will not only please previous subscribers, but will bring new ones, who will fully appreciate the work expended on it by the author, Mr. A. D. Webster of Regent's Park. The diary should, in the year of grace 1905, be of the greatest use to the estate agent, the home timber merchant, and the forester. The familiar dainty red-leather binding, with gilt lettering thereon, has again been adopted, whilst an inner pocket for the insertion of letters, cards, etc., and a pencil in a pocket at the back, adds to the usefulness of the book. Amongst the many items of interest to be found within its many pages (which, being of specially prepared paper, take up such a little space) will be found concise remarks on forestry for each month of the year, rules for planting, thinning and pruning, willow culture, trees for various soils and situations, timber measuring and valuing, profit and loss of barking oak, as well as a complete list of Foresters in every part of the United Kingdom—in short, everything connected with forestry and allied industries is touched upon.

* Webster's Foresters' Diary, 2s. 6d. nett. London: William Rider & Son, Ltd., 164, Aldersgate Street, E. C.





INDIAN FORESTER

APRIL, 1905.

THE AMERICAN FOREST CONGRESS.

PROBABLY one of the most remarkable gatherings ever held in connection with the study of forestry and forest problems as they affect a nation as a whole was recently held at Washington under the auspices of the American Forestry Association. Not only was the Forest Congress the largest which has ever assembled to consider questions affecting this science but it was the most striking gathering which has ever gathered together to consider an economic subject.

The purpose of the Congress is well expressed in the official summons inviting delegates:—"To establish a broader understanding of the forest in its relation to the great industries depending upon it: to advance the conservative use of forest resources for both the present and the future needs of these industries, and to stimulate and unite all efforts to perpetuate the forest as a permanent resource of the nation."

That the country was ready for such a meeting is fully borne out by the large number of delegates who answered to the call, the average attendance at the eight separate sessions being 1,000. But more important than mere numbers were the widely varied occupations of the delegates. It can be easily understood that these should include practically all those engaged directly in forest work together with the leaders in the State Forest Associations; that persons representing the lumbering trade should attend is also conceivable; but that influential representatives from the railroad, mining, irrigation and grazing interests should have made a point of being present shows how seriously the country has set itself to work out the forest problem presented to it, whilst at the same time emphasising the close connection which a sound forest policy has with these varied interests.

It is unnecessary to dwell upon the great interest which President Roosevelt has always evinced in the forest question, or to the great impetus which this interest has undoubtedly given it. Publicly and privately he has ever been in the van as a champion for the proper conservation of the forests in his country, and it must have been a great reward to him to receive such a truly representative gathering as the Congress presented when it assembled to meet him at the State, War and Navy Building previous to the opening of the first day's proceedings.

In addition to a special meeting, at which a notable address by President Roosevelt himself was the leading feature, the programme included half-day sessions devoted particularly to irrigation, the lumbering industry, the grazing industry, railroads in their relation to the forest, importance of forests to mining, and one devoted to national and State forest policy. The mere consideration of such questions, all having an intimate connection with the forests (although this connection has not always, in other countries, been as widely recognised by the individual departments as should be the case) is in itself a remarkable tribute to the thoroughness with which our cousins throw themselves into a matter once they have become convinced of its importance. The Congress went, however, a step further: in order to ensure each industry being correctly and indisputably voiced at each of the sessions a man prominent in the line of work under discussion acted as presiding officer, whilst the papers and addresses presented were by men of note in their particular line of work. When one looks back to the attitude of the lumber trade, *e.g.*, towards forestry but a few short years ago it is a sufficiently striking tribute to the breadth of grasp and intelligence of the nation to find lumbermen on the platform speaking in favour of forest reservation and the importance of strict conservation and working.

Mr. James Wilson, Secretary for the Department of Agriculture, presided over the meeting, and in his opening address placed the matter on a broad and national basis as follows:—

“We are beginning a meeting which is national in its significance. Never before in this country, nor as far as I know in any

other country, has a body of men representing such great and varied interests come together to discuss temperately and foresightedly the policy and the methods under which the highest permanent usefulness of the forest can be maintained. That we, men as varied in our occupations as are the industries and interests we represent, are drawn together by this common cause, may well mark the beginning of a new era in our treatment of the forest. Your presence here is itself the best possible proof that forestry is rapidly taking its appropriate place as an active and indispensable factor in the national economy. The era of forest agitation alone has entirely passed. We are talking less and doing more. The forest problem, as President Roosevelt has described it, is recognised as the most vital internal problem in the United States, and we are at work upon it."

Our space will not permit of our dwelling here upon the papers read upon purely forestry subjects, although note may be taken of the fact that Mr. Aubrey White, Commissioner of Crown lands in Canada, described the forest resources of Canada and the manner in which his Government were looking after their preservation. It is our purpose, however, to draw attention to the remarkable set of papers presented by what may be termed the departments allied to forestry.

The session on the afternoon of the second day was devoted particularly to the importance of the public forest lands to irrigation. The head of the United States Irrigation Service, Mr. F. H. Newell, was in the chair, and the first paper read was delivered by Mr. Guy E. Mitchell, Secretary of the National Irrigation Association, on the "Close Relation between Forestry and Irrigation." Mr. Newell then called upon United States Senator Clark to preside and himself read a paper on "Forests and Reservoirs," outlining in a clear fashion the immense part that is being played by the forests in the reclamation work of which he was the Chief. This important paper was succeeded by one on "The Relation of Forests to Stream Flow" by Mr. J. B. Lippincott, Supervising Engineer of the Irrigation Service, and "Irrigation Construction and Timber Supplies" by Mr. A. P. Davis, Assistant Chief

Engineer of the Service. Two short impromptu addresses on the importance of this subject were also delivered by Mr. H. M. Wilson of the United States Geological Survey and Professor Toumey of the Yale Forest School. We have not space here to touch upon the matter contained in these papers; their titles moreover speak for themselves, and we would suggest that they might be perused with interest in India. They indicate plainly that the Americans, both in and out of the departments concerned, have fully grasped the importance of the principle that the Irrigation and Forest Departments should recognise that whilst the very nature of their work entails their being separate bodies yet the results aimed at by the one require that its members should thoroughly understand the work and mission in the country of the other in all the aspects in which this latter bears on their own duties.

In the session devoted to the Lumbering Industry Mr. N. W. McLeod, President of the National Lumber Manufacturers' Association, was in the chair, and delivered an opening address, which was followed by papers on the "Changed Attitude of Lumbermen on Forestry," "The Importance of Forestry to the Woodworking Industry," "The Lumber Dealers' Interest in Forest Preservation," &c. These papers show in a remarkable manner the great change with which the industry has come to regard forest conservancy.

The Grazing session was presided over by the President of the National Live Stock Association. Mr. A. F. Potter, Grazing Expert of the Bureau of Forestry, delivered an address on "Practical Results of Grazing on the Forest Reserves," illustrating it by examples and explaining clearly the detrimental effect of grazing on steep hill slopes, in forests full of young seedlings, &c. An interesting paper took for subject "Sheep Grazing in the Reserve: from a Layman's Standpoint," by Professor L. H. Pammal, of the Iowa State College. The discussions which followed treated the subject from an exceedingly broad-minded and impartial standpoint, and should prove of considerable interest to those concerned with such questions in India.

With Mr. Howard Elliott, President of the North Pacific Railroad, in the chair, the first session of the third day's proceedings was opened. General Charles Manderson, General Solicitor of the Chicago, Burlington and Quincy Railroad, was the first speaker, and took for his topic "What Information is most urgently needed by Railroads regarding Timber Resources." The following paper, by Mr. I. T. Richards, Chief Engineer, Pennsylvania Railway, on "The Work of the Pennsylvanian Railroad in planting Timber for cross ties (sleepers)," was particularly appropriate since the Bureau of Forestry has initiated widely-exploited experiments in treating sleepers. Dr. Hermann von Schenk's paper on "The Results of the Preservative Treatment of Railway Timber to prolong durability" was also of great interest as he is the officer in charge of the timber-testing plant of the Bureau of Forestry.

The special session held in the afternoon of this day took place in the National Theatre, where President Roosevelt delivered an address on "The Forest in the Life of a Nation" to an audience of 2,000 people. This address made a deep impression, and is certain to have considerable influence since it has been published throughout the country.

Dr. David T. Day, of the United States Geological Survey, took the chair at the mining session, the papers being confined to the subject of Forestry and Mining. Mr. A. L. Fellows, Consulting Engineer, United States Irrigation Service, delivered the opening address on the subject of "The Development of Water Power as related to Forest Reserves," and this was followed by an address by Dr. Day, additional papers being read upon "How the Forest Reserves help mining" and "Mining in the Forest Reserves." A closing address, which excited much enthusiasm, was given by Mr. G. H. Maxwell on the "Value of Forestry to Commercial Interests," in which the author clearly showed how generally the business interests are dependent on the forests of the country.

From the above short notice of the proceedings of this Congress it will, we think, be conceded that the subject was not considered from a one-sided point of view, and it would be impossible to underrate the importance of the result attained; the practically

unanimous consensus of opinion in favour of the value of forests to a country of a body of men—experts in their own lines and looking upon the problem each from his own peculiar and particular point of view.

The verdict arrived at may be looked upon as that of the country at large since the delegates to all intents and purposes represented a plebiscite of the people.

It is perhaps but natural that the thought should arise: Have we anything to learn from this Congress? Can we, by a careful consideration of its conclusions, the conclusions of the finest intellect in the United States, so apply them to the very different conditions we have in India that we may bring home to the minds of the people of the country a fuller and clearer knowledge of the true reasons which render forest conservancy, not merely the broad-minded policy of a great statesman, not merely an aid towards supplementing the revenue returns, not entirely the hobby of a prejudiced class of professionally-trained men, whose object appears to be the harassment of the people, but an absolute necessity both for the country and its inhabitants and in the true interests of their posterity. Such an object is no mere ideal, and it will come within measurable distance of realisation when the various sister Services in India, whose work leads them into contact with the forests of the country, endeavour to make themselves acquainted with the forestry problem as it affects, or is affected by, their own particular work and the people who are dependent on the results of that work. We should most gladly welcome from men in the Indian Services such a remarkable series of papers as have recently been read at Washington; and we are of opinion that there are few who would question their economic utility.

SCIENTIFIC PAPERS.

THE HAUSTORIA OF SANDAL ROOTS.

BY C. A. BARBER, M.A., F.L.S.

The study of the relations between parasites and their hosts is always interesting. We are well accustomed to the presence of animals permanently fixed to others, but that plants should obtain their nutriment by sucking the juices of other plants comes at first as a matter of surprise to the students of the vegetable kingdom. The true nature of such parasitism was not understood until comparatively recent times. For many years it was largely held that fungous outgrowths were a sort of malformation of the plant tissues, and were classed as a kind of disease similar to the galls caused by insects and the tumours of the human body. And although the fact was soon ascertained that there was organic connection between higher plants as well as fungi, it was assumed that the phenomenon was of this tumour nature, and attempts were even made to explain why so great a change in flowers, leaves and fruits should have been brought about.

With our present knowledge of the ravages of fungi upon the tissues of the higher plants, it is not easy to understand the difficulties which offered themselves to early students of plant parasites. The best work of many brilliant Botanists has been devoted to the subject, and we have now a fairly comprehensive knowledge of the manner in which the fluids pass from host to parasite. But the fact that, besides fungi, highly organised green flowering plants, such as the sandal, obtain their nutriment by this irregular means still remains one of the wonders of the vegetable kingdom. It is to this study that I wish to direct attention, especially as all the facts have by no means been elucidated.

Of phanerogamic parasites there are a large number in India ranging from semi-parasitic crop weeds, such as *Striga*, differing little from the ordinary flowering plants, to such forms as *Orobanche*,

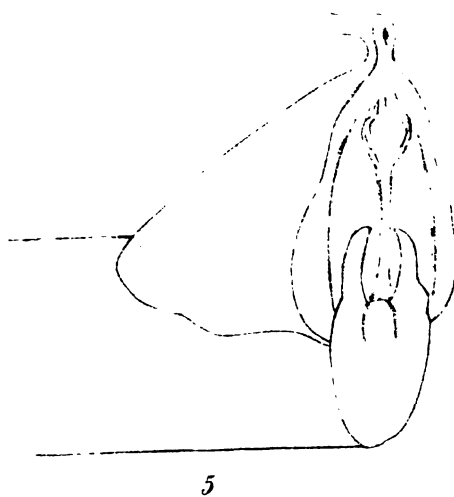
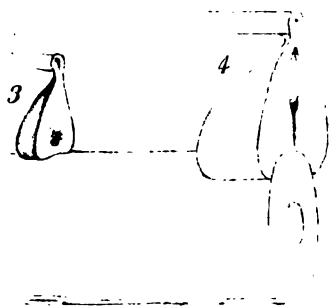
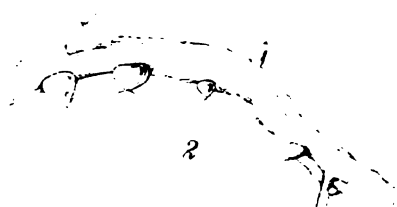
without chlorophyll and with brown scale-like leaves, and the still more mysterious *Balanophoras* of the ghaut forests, whose only resemblance to the higher plants is seen in their spikes of brightly coloured little flowers.

These parasites may be roughly divided into two main classes, according as they attack parts above or below the ground. Of the former, the Indian mistletoes, *Viscum* or the more numerous species of *Loranthus*, the common thread-like *Cassytha* of our dry forests and the various forms of dodder or *Cuscuta*, may serve as familiar examples. They are aërial in their growth, and fasten themselves on the stems of their hosts. Of the other class, the root parasites, the sandal is perhaps the most highly organised, forming as it does a luxuriant and handsome tree, laden with masses of green leaves, flowers and fruits.

It would seem that until recently those who had to do with sandal plantations were uncertain as to its parasitic nature. But it is now beginning to be a matter of some doubt whether the sandal takes its root-nourishment in any other way than by sucking the juices from adjacent plants.

Although the organs of attachment, or "haustoria" as they are called, will adhere to the most unlikely substances, yet in sandal, as in other root-parasites, there would appear to be a certain amount of selection exercised as to its hosts. We have thus been led to speak of such plants as *Tecoma Stans*, *Cassia siamea*, *Casuarina equisetifolia*, *Pterospermum Heyneanum* and *Lantana Camara* as good "nurses," thereby meaning that the sandal grows readily in the company of these plants. This is no new fact, and the most various explanations of it have from time to time been offered. Shade, aspect, the formation of humus, and so on, have been brought forward as dominant factors in the association of sandal with these plants, and it is curious that it did not occur to those interested to study the root system more carefully and to test the sandal's so-called "doubtful parasitism." From pot experiments and from examination in the field it appears that the sandal attaches itself with avidity to the roots of the good nurses referred to, and it is therefore justifiable to assume





2' x 4'

that this underground affinity is of more importance than any questions of shade, aspect or locality. Within certain limits, the condition suitable for the best nurses will be those most likely to produce the most healthy and rapidly growing sandal trees. The effect of neighbouring plants on the quality and quantity of oil in the heartwood would form an interesting study for those Forest Officers who have the advantage of living in sandal-bearing tracts. It is quite probable that, given the most healthy conditions and the proper climate, those nurses will be most useful as oil producers which feed the plants most generously.

I propose, in the present note, as a contribution to our knowledge of sandal, to give a short description of the haustoria. It does not appear that such an account exists, although the allied little *Thesium*, from its occurrence in European regions, has been fully described by more than one observer. The ease or difficulty experienced by the sandal in its attacks on various roots may form the subject of a later communication, but, to avoid excess of detail, which would be out of place in a practical journal, I shall content myself for the present with referring to a perfectly straightforward, simple case in which the attack is easily and successfully carried out.

I have shown in a previous note that the haustorium arises independently of the presence or even nearness of surrounding rootlets. It is probable that in case no host is met with, a comparatively rare occurrence in nature, the haustorium remains small and ultimately withers away, but if a foreign rootlet is met with, it grows rapidly, and develops into a mass of white tissue, at first club-shaped, but later on adapting itself to and enfolding the surface of the root attacked, and taking on more or less the form of a flattened bell, figs. 1 and 2.

The haustorium applies itself closely to the surface of the root. It becomes enlarged at the point of contact, increasing in the direction of the root's length, and thus becomes elongated and concave with an oval outline. While the haustorium, at its origin from the parent root, frequently many times smaller than itself, remains narrow, it increases in diameter as it nears the

point of application, and thus its conical or bell-like form is assumed. These points are illustrated by the accompanying drawings and diagrams, figs. 3—5.

It is usual, when studying the tissues of the haustorium affixed to a root, to pay special attention to the section passing through the length of the haustorium and at the same time cutting the attacked root across, for in this section most of the tissues concerned are brought into view at the same time. But, thoroughly to understand the matter, it will be necessary to study the arrangement in at least three different planes. These are as follows :—

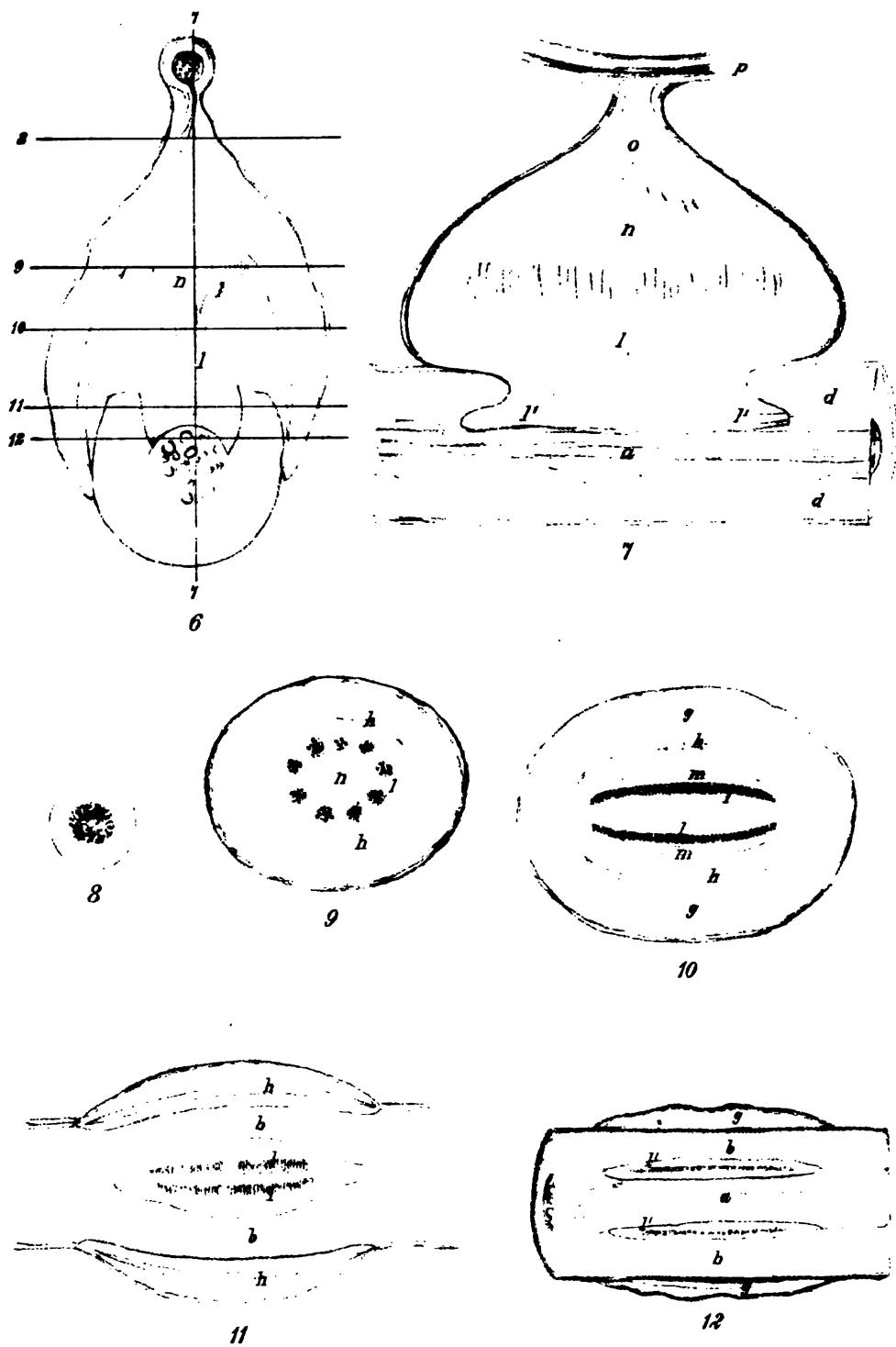
(1) *Transverse section*, cutting across the root attacked and therefore through the haustorium from its point of origin to its point of attachment, fig. 6.

(2) *Longitudinal section*, cutting lengthwise both the haustorium and the root attacked, fig. 7.

(3) *Tangential section*, cutting the haustorium transversely and the attacked root tangentially or parallel with its long axis. Figs. 8—12 show tangential sections at different levels, and their positions are indicated by the cross lines in fig. 6.

It will be seen that the name given to the section depends upon the direction in which the attacked root is cut, and this is natural, because this organ gives the haustorium its characteristic shape and regulates the internal distribution of its tissues. It will also be understood that the character of the tissue elements, as well as their arrangement, can only be determined by examining all of these sections, and to make matters clear the outlines referred to above may be consulted and compared.

The transverse section is the most important, for the reason already mentioned, and this will be studied in detail. The outline of such a section will vary much according to the relative size of the haustorium and the root of the host, to the age of the haustorium and the species of the plant attacked, and, finally, according to the ease or difficulty experienced by the parasite in its attempts at penetration. In perhaps the most usual case the root attacked is small and the haustorium spreads itself out



after contact until it considerably exceeds it in breadth. Transverse sections will then remind one of the saddle on a horse's back, but to the saddle is fixed a "pack" or bundle of considerable dimensions, and the saddle is secured, not by the usual girth round the animal's body, but by a process penetrating its back, cf. figs. 4, 5, 6 and 13.

The tissues exposed in the transverse section are of great variety, showing an organ of some complexity. Taken as a whole, those of the haustorium are white and succulent, while those of the root are hardened, brown and more or less decomposed. Three main regions may be distinguished in a well-cut section :—

- (1) that of the root attacked, fig. 14, *a—e* ;
- (2) that of the haustorium, *f—o* ;
- (3) that of the mother root *p*, the latter not always included if the section is not strictly median, and varying also with the direction in which the mother root is passing, cf. figs. 6 and 13.

The drawing with its explanatory diagram (figs. 13 and 14) is taken from a sandal root grown in a pot with *Pterospermum Heyneanum*. The root of the host is seen to be split as far as the cambium layer *c*, while the two cortical "wings" *b* are thrust apart on either side to make room for the penetrating process *k*. The woody cylinder *a* is composed of thickened elements, and has thus been able to resist further intrusion, but it is not always so. When the medullary rays are large and the sclerotic cells of the wood alternate with thin-walled parenchyma as in *Opuntia Dillenii*, the penetrating process may proceed to the pith and even beyond it, rupturing the woody cylinder irregularly. In *Thespesia populnea* the vascular cylinder is sometimes split completely in two, and so on. The present case may be taken as typical of dicotyledonous roots with a vascular cylinder of some density. When the haustorial cells reach the cambium, they follow it to either side, and, in the case under examination, spread out until they embrace more than half the fibro-vascular cylinder. As will be seen later, it is the aim of the intruding sucker to bring its absorbent cells into close contact with the conducting

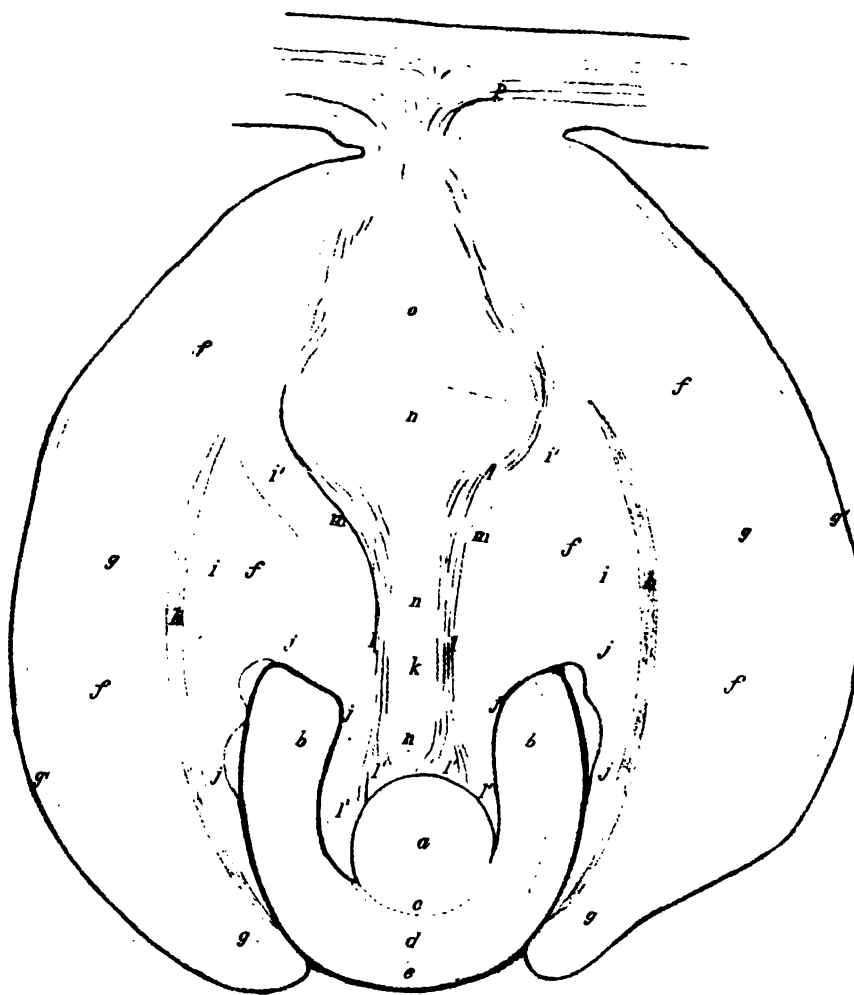
elements of the host's root, namely, the younger woody tissues. No further growth takes place in the attacked root in the place where the cambium has been invaded, the cells of this layer having been completely destroyed, but the formation of wood and bast proceeds for some time in the uninjured portion.

The alterations caused by the parasite in the tissues of invaded roots form an interesting study, which for the present must be passed over. Suffice it to say that the roots attacked are by no means passive, and, although usually ineffectively, show their disapproval in a variety of ways differing according to the species. Layers of cork, thickening of the cell-wall, the formation of thyloses and the extrusion of gum (?) are commonly met with, while the occasional cases where a sandal root becomes attached to itself show a distinct attempt on the part of the root attacked to form new tissues and occlude or grow round the haustorium.

The haustorial tissues have been divided in *Thesium* into two portions, the outer clasping "cortex" and the inner, penetrating "nucleus," divisions which may for the present be adopted.

The cortex is formed first and consists, in the mature haustorium, of non-absorbing cells which have lost their activity and have become what is called "permanent" tissue. These cells, now that penetration has been effected, have ceased to grow or divide, are fast losing their protoplasm and have become a protective layer for the younger cells of the nucleus within. But the different parts of the cortex do not cease their growth all at the same time, and the pressures and tensions exerted on the one hand by the increasing inner cortex on the quiescent outer, and on the other hand by the growing nucleus on both, have given rise to the somewhat characteristic and peculiar features now to be noted. The most striking character of the cortex is the presence of two bands of tissue *h* symmetrically placed on either side, and extending from the upper portion near the mother root down to the edges of the flaps of the "saddle." These bands, on examination, are seen to be homogeneous and





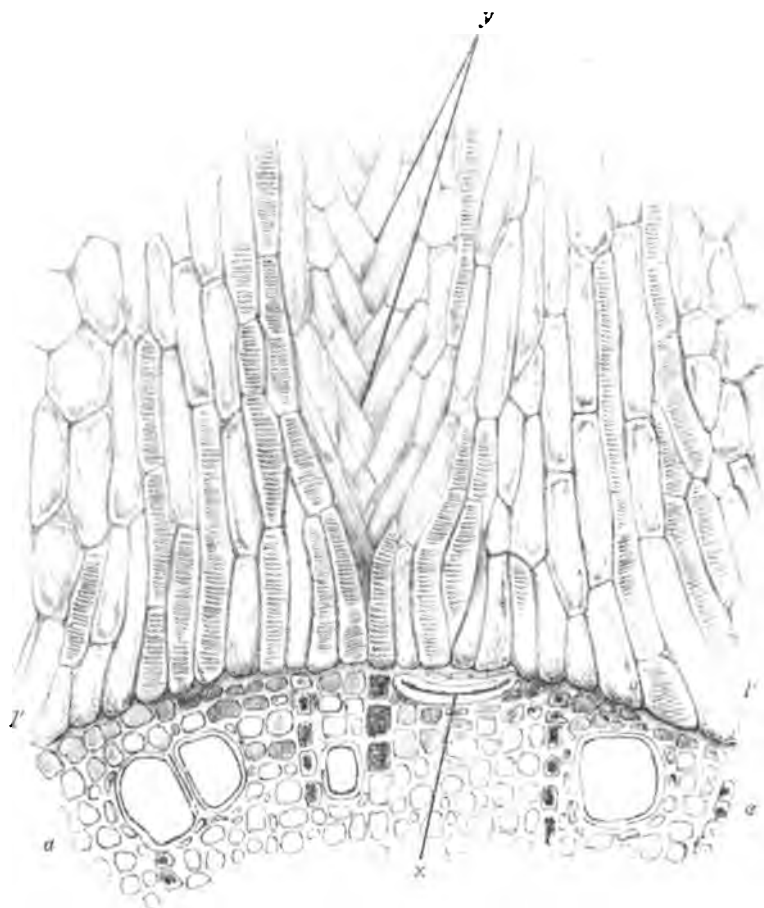
highly refractive, are very sharply marked, but without definite cell cavities. A careful study of their formation shows that they consist of the compressed walls of a number of collapsed cells. From their marked character and constant presence in all haustoria, they have been utilised to divide the cortex into an outer and an inner portion, and have been called a "separation layer." The origin of these collapsed layers, as I prefer to call them, does not seem to have been very clearly explained in the literature at my disposal (they occur also in *Thesium*), but, from a study of early stages of development, there is little doubt that they indicate lines of pressure between actively growing, turgid cells and such as have lost their turgidity and are becoming permanent. The increase in diameter of the developing nucleus and the still turgid cells of the inner cortex have exerted such pressure upon the dying cells outside, which are incapable of expansion, that the latter are crushed flat at the point of contact. That this is the correct view is supported by studying the subsidiary collapsed layers which occur in the section. These are almost always found round the borders of the cells outside *j*, between *k* and *o* and outside *i*¹ on either side. At *i*, on the other hand, considerable tension is exerted by the rapid growth in length of the nucleus when actual penetration is being effected, cf. figs. 4 and 5. The tissues in this region are therefore not only collapsed, but also torn asunder so as to form a series of lacunæ. All these layers are formed at different periods of growth, but, generally speaking, the internal tissues retain their turgidity longer than the outer earlier formed ones. Thus those of the outer cortex die first, those of the inner cortex *i* next, while the other portions of the inner cortex *i*¹ and *j* are transformed into permanent tissue only after penetration is effected and absorption is taking place. It may be further stated generally that when the junction between the tracheides of the haustorium and the vessels of the host is effected, all the parenchymatous tissues gradually lose their protoplasm and become clear, so that it is possible by observing their character to determine the age of the attachment.

Having thus cleared the ground by the study of the collapsed layers, whose presence in the section is a constant source of wonder and confusion, we can proceed rapidly to refer to the different tissues separated by them from one another.

The cells at g^1 are crushed outer cortical cells. They take the place of cork and afford an outer protecting layer to the organ. Periderm is not usually formed, but has been detected in certain cases, *e. g.*, *Pithecolobium dulce*. The cells of f , g , h , i have been already referred to. The tissues at l^1 remain active for a longer period than the rest. That at j surrounds the two cortical wings of the root of the host on all sides. The cells are arranged side by side at right angles to the surface of the wings, and have probably been absorbent or capable of absorption in earlier life.

In the nucleus, $k-n$, the cells at n have become permanent with or without a collapsed layer down the middle. They do not appear to take any part in absorption, and definitely terminate at some distance from the woody cylinder of the host. These cells are much elongated in the lower part of the nucleus, but in the upper, expanded portions are more or less isodiametrical parenchyma. They are sharply marked off these by a collapsed layer from the cells of o .

The effective portion of the nucleus may be divided into two parts, an upper, conducting and a lower absorptive. The two vascular strands l , composed of tracheides, are early set apart as conducting tissue, to transfer the stream of water and salts from the host to the mother root. A glance at these strands shows that they are parallel for the greater part of their length, but that they widen out at both ends. The widening at the lower end is trifling in the figure, but is sometimes very noticeable. It depends on the diameter of the woody cylinder of the host. The widening at the upper end is sudden and constant, and is less easy to explain. A study of the tangential sections through different heights of the nucleus will furnish a possible solution of figs. 9 and 10. It is seen there that the number of tracheides in the nucleus are about the same in quantity at these two levels. In the lower part, which is drawn out in the direction



15

of the host's root, the tracheides are arranged in two parallel bands. In the upper part, which is much narrower, the tracheides are arranged in a circle or nearly so. The widening seen in the transverse section is necessary to accommodate the whole series of tracheides so that continuity shall not be broken in the passage of the fluids. The suddenness of the expansion is not explained, and it is more probably due to the fact that the lower portion of the nucleus alone takes part in the rapid elongation, when penetration takes place, while the upper expanded portion is enabled to increase in the ordinary, radial direction.

Outside these tracheides, on both sides, there are certain thin-walled cambiform cells *m*. Fortunate sections show that these cells have arisen from the same mother cells as the outer tracheides, and their position indicates that they form a short-lived cambium by which new tracheides can be added to the vascular strands when needed. There is no appearance of sieve-tubes in the sections examined. A much smaller band of meristematic tissue is seen on the inner side of each strand in some sections, but it does not appear to be of the nature of cambium and has no apparent relation to the adjoining tracheides.

The absorbing portion of the nucleus is seen at *l'* and in fig. 15. All the cells of the nucleus in contact with the woody cylinder of the host take part in this work, and direct connection is readily traceable under the microscope between the elements belonging to the two roots. In one sense this is the most important and interesting part of the haustorium.

The absorptive cells consist of tracheides and elongated parenchyma between them. The tracheides sometimes communicate directly with the vessels of the host, but are generally content to apply themselves to the wood parenchyma. The parenchymatous absorbent cells apply themselves to all the parts not occupied by the tracheides. Here the real transference of nutriment from the host to the sandal takes place, and the whole apparatus is designed both to protect this vital part from harm and to expose to the action of the haustorial cells as large a surface as possible of the conducting cells of the host.

The action and arrangement of the tracheides differs according to the species of root attacked. In some, as *Jatropha curcas* and *Coleus sp.*, where the vessels of the vascular cylinder occur in well-separated radial rows, they appear to be only applied to the ends of these rows of vessels.

But in the majority of cases examined they are in contact with all the elements of the wood alike. Usually in intimate contact, the cells and tracheides of the haustorium are sharply separated off by cell walls from the elements of the root attacked. In some, however, as *Gyrocarpus jacquini*, the tracheides actually appear to penetrate the vessels after the nature of thyloses.

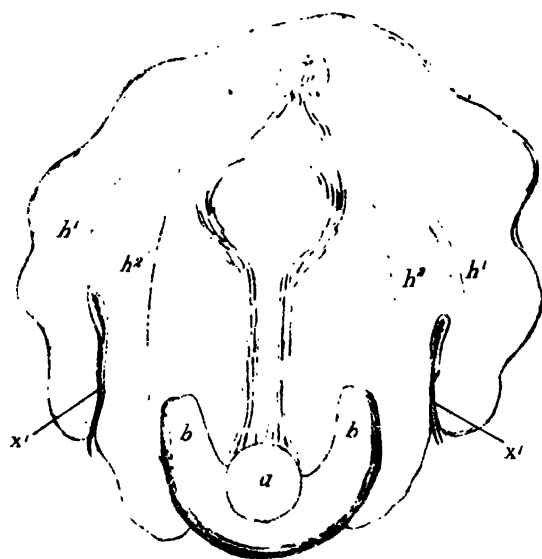
The cells of the haustorium differ a good deal as to the nature of their contents. Those of the nucleus are, taken generally, filled with granules and protoplasm (with the exception of course of the area of tracheides), and this gradually disappears as the cells increase in age. The cells of the cortex in a similar manner are full of starch, which becomes disintegrated and finally disappears as the cells become permanent tissue. It is probable that this store of starch is used up during the actual penetration, which takes place at a rapid rate.

As a consequence of this difference in contents, the nucleus is yellowish and turgid in sections from spirit material, whereas the cortex is white and clear.

So much for the transverse section. Reference should be made to the tangential and longitudinal sections, figs. 6—12, whose lettering is the same as for that in fig. 14.

The tissues of the haustorium having been passed under review, it remains to consider the manner in which an entrance is effected into the root of the host. The means adopted are three-fold:—(1) The cells of the surface of the haustorium have the power of *dissolving the walls* of the root cells opposed to them; (2) *Pressure* is more rarely exerted, but is evidenced by the compressed cells of the haustorium before entrance has been effected and the occasional collapsed vessels in the roots attacked, cf. *x* in fig. 15; (3) In large haustoria a well defined *secreting gland* is present.





The substance secreted, having the power of dissolving cell walls, is probably some *cyto-hydrolytic ferment*, and the translocation of starch grains points to the presence of a *diastatic ferment* as well. Both the epithelial cells of the gland and the epidermal cells when they are in contact with the tissues of the host show large nuclei and abundant granular protoplasm such as is met with in secreting cells.

The outer, cortical flaps of the haustorium are usually single, as drawn in the figure. Cases are not infrequent however where two flaps are present on each side one over the other, fig. 16. When this is the case we may speak of "double haustoria." The second flap h^2 arises from a great development of cells in the inner cortex on each side, and appears to be due to failure on the part of the haustorium from some cause in effecting an entrance. As far as can be gathered from the cases examined partial entrance has been made, but the lobes of the haustorium have diverged before reaching the cambium. Thus a small piece of dead bark is always to be seen at x^1 . When once the cambial layer is reached a second, inner flap is not formed. Each flap formed has a well defined collapsed layer exactly similar to that in the first one. In one case met with four such superposed caps were noted.

In conclusion it may be noted that the haustoria vary a good deal in their complexity, according to the substance to which they are attached. The gland does not seem to be always present. It is of course only needed in young haustoria, but its former existence can be readily detected in older stages, *cf. y*, fig. 15. This points to a greater simplicity of the whole organ, and is chiefly met with where the root attacked is small or when the haustorium is attached to small bits of decaying leaves or bark, or the nitrogenous tubercles of *Leguminosæ*. In such cases even the tracheides are inconspicuous or absent, and the collapsed layers may even be wanting. In the haustorium mentioned above which had attacked a small chrysalis, a double cortex was present, but the whole structure was extremely simple. A great mass of parenchyma was pushed into the cavity of the chrysalis, the epidermal cells of which had grown out in the manner of root-hairs.

The curious fact has been noted that the haustoria may become attached to inorganic objects such as pebbles. A number of these have been examined, and they show a series of different stages of development, short of the penetration and the formation of the tracheides. The epidermal cells, or rather those immediately beneath them, show a constant tendency to grow out after the manner of root-hairs, and insert themselves into the depressions of the surface of the pebble. In one pot examined by far the largest haustorium was fixed so firmly to a big pebble that it could be swung about without becoming detached, and a well developed gland was present, *cf.* fig. 2.¹

The numerous unattached haustoria of the sandal were thought by Scott, their discoverer in 1871, to indicate that the sandal is much less parasitic than it was formerly. But it seems to me to be quite as reasonable to deduce a developing parasitism from the clumsy and futile attempts just described, and I propose to carry this study further as time permits.

MADRAS :

29th December 1904.

Explanation of the figures.

- (1) A large haustorium of *Santalum album* on a *Casuarina* root.
 - (2) A piece of *Casuarina* root much attacked by haustoria.
 - (2') A haustorium firmly fixed to a pebble. Magnified four diameters.
 - (3) (4) Young haustoria cut open to show the parts before penetration. In (4) there is a gland forming at *g*.
 - (5) A mature haustorium open cut showing penetration.
 - (6) - (12') Studies of sections of haustoria in different planes under simple lens magnification. The letters refer to the parts shown in figs. (13) and (14).
 - (6) *Transverse section*, the haustorium cut lengthwise and the attacked root across. The numbers 7-12 indicate the planes in which the succeeding sections are cut.
 - (7) *Longitudinal section*, both haustorium and root cut lengthwise.
 - (8)-(12) *Tangential sections*, at different levels, of fig. (6). The parts will be best understood on comparing the letters with those in figs. (13) and (14).
 - (13) A transverse section through a haustorium on a root of *Pterospermum Heyneanum*, magnified about 40 diameters.
 - (14) An outline key to fig. (13).
- a-e*, the root attacked, *f-u* the haustorium proper, *o* the region of transition from haustorium to mother root, *p* the mother root.

The root attacked. *a* vascular cylinder, *bb* cortical wings thrust aside by the penetrating process or *sucker* of the haustorium, *c* cambium, *d* cortex, *e* bark, chiefly cork.

The haustorium may be divided into *cortex f—j*, and *nucleus k—n*. In the cortex, *g* outer cortex, *g'* squashed outer protecting layer, *hh* collapsed layers separating the outer cortex from the inner, *i* lacunar tissue of inner cortex, *i'* starch-filled parenchyma, *j* epithelial layer enfolding the "wings" of the attacked root.

In the nucleus, *l* the two strands of tracheides, *l'* the absorbent portion of the haustorium directly in contact with the vascular cylinder of the host, *m* the short-lived cambium, *n* the inner part of the nucleus.

(15) A small portion of a haustorium on a root of *Casuarina equisetifolia* showing the actual contact of the absorbing cells and the vascular cylinder of the host. The part illustrated is that between the two inner *l' l'* of fig. (14) and is magnified between 400 and 500 diameters.

a woody tissues with vessels, wood parenchyma ? and medullary rays. A collapsed vessel is seen at *x* and the dark boundary line represents the position of the decomposed cambium. *l' l'* the absorbent cells, parenchyma with granular protoplasm and tracheides. At *y* in the centre the remains of the *gland* are seen. See also fig. (4) for a young stage of the gland.

(16) A "double haustorium" attacking a sandal root. *h' h'* the collapsed layers of the first formed cortical flaps, *h* h** the collapsed layers afterwards formed from the inner cortex, *x' x'* pieces of bark showing the depth to which the first penetration took place, just as *bb* shows the second and more successful attempt.

* NOTE.—For much of the material used in the preparation of this paper I am indebted to Ry. Rama Rao, of the Madras Forest Department, who has the advantage of residing in a sandal tract.

ORIGINAL ARTICLES.

A WORKING PLANS BRANCH

BY G. S. HART, I.F.S.

As must have been the case with all the recipients of the January number of the *Indian Forester*, I was very pleased to see the great improvement that has been effected in the garb of the Magazine, and I think that the Committee of Management are also to be warmly congratulated on the fact that the *Forester* has signalled its appearance in its new form with the important article on the formation of an Indian Bureau of Forestry.

The views expressed in that article that much of the sylvicultural, commercial and scientific work which should have been done has had to be neglected owing to the fact that the time and energy of the present staff are fully occupied with their executive duties, are not open to argument. Still there can be equally no doubt that much valuable work of this kind has been done, only there has been no organisation for collecting it and circulating it in a useful form, so that it has remained of very little advantage except to the compilers themselves. It is here, I think, that the Department is to blame, for probably one of the main reasons that we have no organisation of this description is that we have never taken the trouble to ask for it with sufficient insistence. However, it is never too late to mend, and for this reason I look upon the article under reference as one of the most important that has appeared in the *Indian Forester* for some time past, and I am writing these few lines in the hope that the Department generally will take up this question and show that, as a whole, they are fully sensible of the great advantages such a Bureau will give them.

For the present I propose to confine my remarks to the subject of working plans, of which I have had some little experience. Of the other subjects one is already provided for, and though I would not for one moment belittle the great importance, indeed the necessity, of organised investigation into the subjects of Forest Botany and Minor Products, or the beneficial results, financial and otherwise, that must attend such investigation, still I think that working plans are the most important branch of our work and the one of which the management under present conditions calls most urgently for revision. The future of the forest estates committed to our control depends on the plans we make for them; but how are these plans made now? In one of the largest circles in India most, if not all, of the plans turned out during the last twelve years have been compiled by the Divisional Officers with such assistance as could be given to them in the shape of the last joined recruit from Home, or a junior extra Assistant Conservator, or a Forest Ranger taken off his ordinary work, and this too mostly changing from time to time

during the compilation of the plan. Obviously really good work cannot be done under these conditions. A working plan requires the whole time and attention of the officer responsible for its production: it is not the kind of work that can be done in sections at such times as the exigencies of Divisional work permit, nor is it the kind of work on which an officer can be usefully employed, either directly in charge or as an Assistant to compile the plan under the general supervision of the Divisioned Officer, until he has had five or six years' practical experience of forest work in this country to back up the theoretical knowledge acquired during his Home training. Our sample plan, however, is completed in this way and then goes to the Conservator for scrutiny. It may be held that this should be quite sufficient, and that the addition of the Conservator's advice and assistance during the preparation of the plan should be all that is necessary to ensure its suitability. The Conservator, however, may have several plans in progress at the same time, and it may be quite impossible for him to give to each the attention it requires, or he may be new to the circle, in which case he is obliged to devote all his time to making himself acquainted with the general conditions of his charge and to getting a working knowledge of the Divisions, or perhaps he may be of opinion that there are other more important matters requiring his attention, so that it is at least possible that the Conservator's share in the plan may not be all that could be desired. Finally, our plan is countersigned by various Civil Officers, put into print and despatched to the office of the Inspector-General of Forests, where it may be passed or rejected. In the former case it goes on to the Local Government and is sanctioned, while in the latter it returns to its unfortunate compiler or his still more unfortunate successor for correction. Even, however, when finally sanctioned by the Local Government it is by no means quite certain that its provisions will be strictly adhered to for very long, for under section 88 of the Forest Code the Conservator, in conjunction with the Local Government, can do a good deal in the way of modification, so long as his action does not amount to "a revision of the general scheme of management," a somewhat elastic definition.

Now with all due deference, and perhaps some little trepidation also, I venture to hold that this is wrong. There is altogether too much chance about it. In the first place the chance that the plan will not be properly dealt with by the officers compiling it and the Conservator. Secondly the chance that it may be upset through inadequate knowledge of local conditions, and, thirdly, the chance that the provisions may be a good deal modified before they have had an opportunity of proving their suitability. To get rid of these chances we want to ensure careful consideration of the proposals between the Working Plan Officers and an officer employed on work of this kind only, for I think that most men who have had much experience of Working Plans will agree with the proposition that it is not possible for any officer, however able and experienced, to pass a really valuable opinion on a Working Plan until he has obtained a practical working knowledge of the forests concerned and of the prevailing local conditions, a knowledge which can only be obtained by a personal visit to the forests and which cannot be acquired by the perusal of any number of reports in an office. Then we want to make certain that no modifications whatever, except possibly fellings in deficit, can be made by the local officers without reference to the authority who finally approves of the plan before it is sent to the Local Government, and, finally, we want all the available information connected with Working Plans collected together and distributed periodically.

These requirements can only be met by the appointment of a special Working Plans Branch under the direct control of the Inspector-General as outlined in the article under reference. The only point on which I think exception might be taken to the proposals made in that article is in connection with the necessary staff, for it seems to me that at least three officers would be required. Surely Burma would take up the whole of one man's time, and one other officer would hardly be able to do the work in all Indian circles, excluding Bombay and Madras. One other point, a sordid one, but still one that in the present condition of the pay of the Department would have to be considered. If ever appointments of this description come into being they should be made

prizes, so that, in addition to the unquestioned honour that the appointments would carry, there should be something a little more substantial to make men work to get them. There should be no question of any appointment in the Bureau being refused by an officer on the ground that he had given hostages to fortune and could not afford to take it, as he was better off where he was.

REAFFORESTATION IN THE DECCAN AND OTHER DRY DISTRICTS.

BY H. F. ARBUTHNOT, I.F.S.

In Bellary district there are large areas, particularly in the Adoni Range, which have been included in reserves but contain no tree-growth whatever. Some of them on rich loamy soil were probably at one time under cultivation and subsequently allowed to revert to waste. They produce fairly good grass and serve as grazing grounds for the neighbouring villages. They are, however, capable of supporting forest growth, and it would be both profitable to the Department and convenient to the surrounding inhabitants, particularly in the big towns, could this forest growth be produced. At present the demand for firewood is so much ahead of the supply that it has to be met from the adjoining district Kurnool. Other bare areas are the outlying spurs of hills which have been so freely indented on for firewood and small timber by the inhabitants of the adjoining villages and so trampled down by their cattle that hardly a vestige of vegetation remains ; and there is no doubt that but for severe restrictions both on grazing and on the removal of firewood and small timber these blank areas would spread at the expense of existing forest. These restrictions, especially the restriction on the removal of timber and firewood, press very hard on the villagers, who have to practise the most rigid economy to make the supply of fuel on the unreserved lands suffice. These hardships are, of course, due to the improvidence of previous generations, and the present generation must endure them ; but it is incumbent on the Department to endeavour to remove these hardships for the next generation by reclothing these areas with forest.

But the question is, how? The average rainfall in the district is something under 20 inches annually, all of which falls between the second week of June and about the middle or end of October, with the exception of a few heavy showers in May. For about seven months in the year, then, there is no rain at all and struggling vegetation has to endure intense heat from the end of February to June. If planting is undertaken, the young plants must be watered for these months in their first year and at least for the hot months in their second year if they are to survive, which makes the cost of the undertaking almost prohibitive even on level ground where wells can be sunk and watercarts employed. On hilly ground planting would be impracticable. If seed is sown naturally or artificially the young seedlings cannot survive the hot weather and die off. At best the root system remains alive, and they spring up again the next rainy season, but I believe that as a rule it takes at least six years, and possibly as much as ten, before the root system is strong enough and deep enough for the plant really to begin to grow.

I believe that the solution of the difficulty can be found in the method that ryots employ in the Adoni Range for making Neem (*Melia azadirachta*) hedges for their fields—a method that I have never seen employed elsewhere. It is to make ridges two feet high and sow the Neem seed on the top. No trench is dug, but the ridge is made by simply scraping up the surface soil. The sowing takes place in June or July, and without any watering most surprising results are obtained. One hedge that I saw had been sown, I was told, less than two years before, and the saplings were already seven or eight feet high and eight or nine inches in girth. I sowed some Neem and Acha (*Hardwickia binata*), which was the only seed I had at that time, on this principle in October 1903 before the north-east monsoon was over. The Neem seed was unfortunately all eaten by rats and never germinated. The Acha seed germinated, and in the following February I dug out one of the seedlings for examination. I did my best to get the whole root system out, but after digging down as far as I could get my arm in I had to break off the two rootlets. The length of the root system which

I dug out was three feet from the column, and the root below the column was the thickness of an ordinary pencil. I then dug out one of the plants which had been planted in the neighbourhood in a pit 18 inches cube and had been regularly watered since July, when it had been planted. This I found had hardly grown at all and had a comparatively weak root system. The general appearance, too, of the seedlings sown on the mounds and unwatered was far healthier than of those which had been planted and watered.

The explanation of the vigorous growth of plants sown in this manner and of their not requiring water is, I believe, that the soft earth in which they are sown induces a very strong development of the root system and that the heap of earth retains moisture at a higher level than would ordinarily be the case. In digging out the Acha seedling I found the earth quite moist at or even slightly above ground level though there had been no rain for three months and the ground elsewhere was dry.

I went on leave shortly after this, and am therefore unable to say how these seedlings have progressed during the past year. Had I returned to the district I had intended to have tried sowing seeds of different species on mounds on some of the bare spurs of hills that I referred to at the beginning of this note and to have continued the experiment of ridge sowing on the plain areas on a larger scale. I was in charge of North Coimbatore district for a few months on my return, and made a series of ridges 18 feet apart in Sulavazi reserve of the Erode Range, the whole covering an acre of ground. The cost of the operation was only Rs. 5. I only made the ridges one foot high instead of two feet, as I wished to see how the seedlings would do on the smaller ridge. Bigger ridges would, of course, have cost more. Unfortunately it was late in the year and there was no more rain after I finished the sowing, though it was raining when I began the work and the rain had seemed likely to continue. Hence there was not enough moisture for the seed to germinate. As I am now on special duty and unable to continue the experiments, I write this note in the hope that some one else may carry them on, as this method seems likely to solve the difficult problem of reafforestation of blank areas in dry districts.

CORRESPONDENCE.

THE INADEQUACY OF THE FOREST STAFF IN BURMA.

The following figures, which were lately compiled with reference to a certain enquiry, may interest your readers. They bear eloquent testimony to the inadequacy of the present staff in Burma and demonstrate how futile must be all attempts to treat our forests on any but the broadest lines. The total area of reserves is over 20,000 sq. miles, and it is estimated that within the next five years this will have increased to nearly 30,000 sq. miles. Can it be wondered at that Forest Officers in Burma are alarmed at the rapid increase in the area under fire protection without a corresponding increase in both controlling and executive staff?

CAMP :

H. S.

16th January 1905.

	NORTHERN CIRCLE.		SOUTHERN CIRCLE.		PEGU CIRCLE.		TENASSERIM CIRCLE.		AVERAGE.		REMARKS.
	Reserved Forest.	Unclassed Forest.	Reserved Forest.	Unclassed Forest.	Reserved Forest.	Unclassed Forest.	Reserved Forest.	Unclassed Forest.	Reserved Forest.	Unclassed Forest.	
Area of Circle, sq. m.	4,783	25,044	5,322	43,703	5,291	21,068	4,666	29,348	5,016	29,791	Figures at close of 1903-04.
" " Division "	697	3,578	887	7,284	661	2,646	777	4,191	756	4,425	
" " Range "	133	696	140	1,150	143	569	141	889	139	826	
" " Beat "	35	181	23	186	26	103	41	257	31	182	

FIRE PROTECTION IN THE TEAK FORESTS OF BURMA.

In the August number of the *Indian Forester* Mr. Rodgers gives the following statistics in regard to teak trees girdled in the Toungoo Division :—

Class A—trees damaged by fire and of inferior value ...	299
Do. B— do. do. but of full market value...	2,057
Total trees girdled ...	3,959

Presumably therefore 1,603 of the trees girdled were undamaged.

He explains that "notes were only made regarding those trees which were girdled." * * * "Class A includes those trees which were so much damaged by fire as to have lost a certain part of their commercial value. Each tree contained a cavity; * * * they were only girdled if there was a fair length of sound timber above." Would he tell us how many there were of those trees which were too unsound to be girdled, as they materially affect the value of his figures ?

He includes in Class B those trees which, although damaged by fire, have not yet lost any of their commercial value, and states that in his opinion this damage commenced in the year 1852. Now, I would ask whether it is possible for trees to have remained in a more or less half-dead condition for over 50 years and to have lost none of their commercial value ? The damage would probably take the form of killing the sapwood on one side of the trees, in effect partly girdling them, and any timber merchant will tell you that trees which have remained a long time partly girdled, even though sound, are, owing to the inequality of their growth and seasoning, much inferior in value to trees which have grown uninterruptedly on all sides and have been killed by one girdling. In my opinion an examination of the proportion of unsound timber in the Rangoon timber depôt would give more reliable figures. Of course all unsoundness may not be due to fires, though in most cases I believe it is, but, on the other hand, there is generally a considerable residue of girdled trees left by contractors in the forest as too unsound to be worth bringing out, which would be left out of the calculation.

It would be interesting if the officers in charge of the Tharrawaddy and Prome Divisions would give the readers of the *Indian Forester* an account of the present state of growth of teak, especially as regards the younger classes, in the Mòkka-Bilin, Bwet, Nyanlè and Kangyi reserves, which are about the oldest fire-traced teak forests in Burma. The Mòkka-Bilin reserve, in which the undergrowth is largely *Cephalostachyum pergracile* and *Bambusa polymorpha*, has been under protection since 1873 and the other

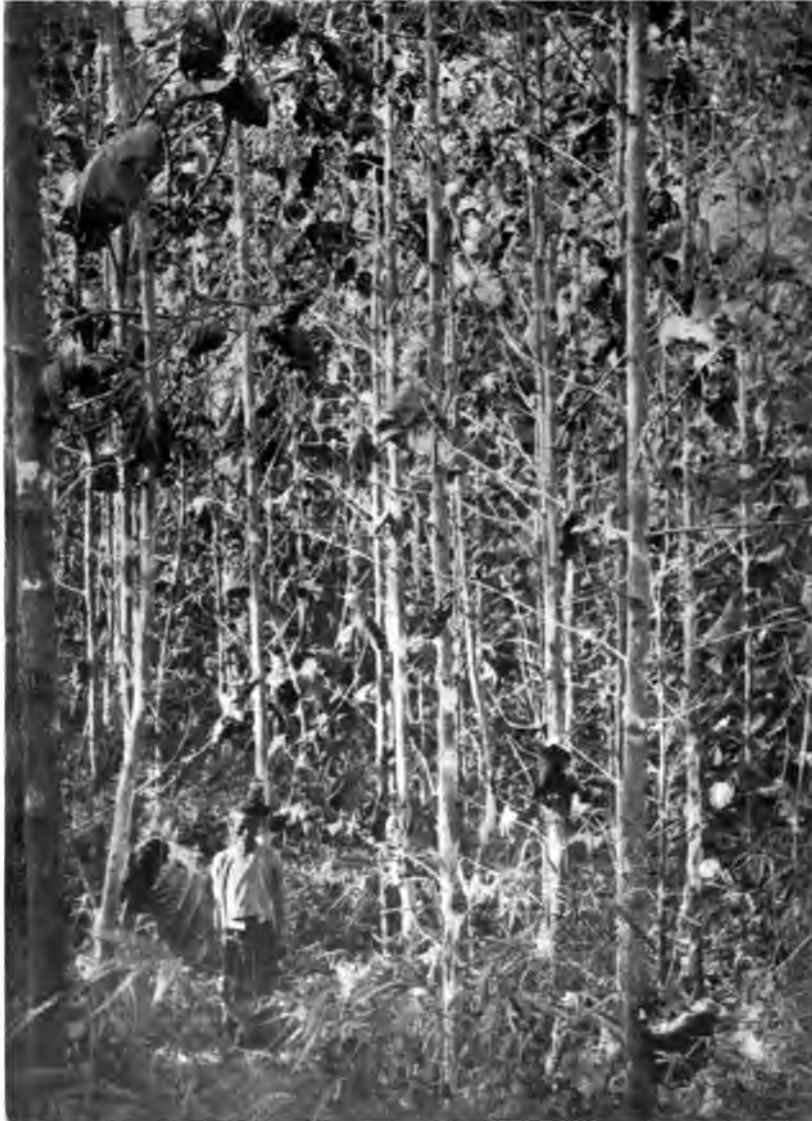
three since 1877. In Bwet and Nyanlè the principal undergrowth is, I believe, *Dendrocalamus strictus*, while in Kangyi there are no bamboos over the greater part of the teak-producing area. They should thus afford good examples of the effect of fire protection in different classes of teak forest.

I doubt whether there will be much reproduction of teak in Mòkka-Bilin except when the bamboos flower, for, as far as my experience goes, under ordinary circumstances, there is practically no teak reproduction in this class of forest, whether annually burnt or not, as any seedlings which may germinate are almost invariably suppressed by the dense shade of the bamboos.

When the bamboos do flower, judging from past experience, I am of opinion that the judicious use of fire will certainly be advisable. As is well known, the bamboo clumps fall apart when they die and, if not burnt, render the forest absolutely inaccessible for several years, and this state of things is aggravated by a dense growth of climbers which come up and twine round the fallen culms, suppressing or injuring most of the tree seedlings under them. If a fire did occur in a protected area after the culms had become dry (and in spite of all precautions it almost certainly would occur) the damage to the tree growth would be enormous. Wherever therefore there is any young teak growth worth considering, I should choose the least of two evils and burn the forest early every year, commencing with the flowering, until the dead bamboos have disappeared, so as to get rid of them gradually and then protect. The damage to the growing stock in this way would not be so very great, and if teak trees were at hand there would be a fair amount of new reproduction. Where teak is absent and it is practicable to make sowings of teak the forest might be protected till the bamboos were thoroughly dry and then burnt, in order as far as possible to clear the ground for sowing.

Sowings in flowered *C. pergracile* areas, with and without the use of fire, have from time to time been made on a small scale in the Mòkka-Bilin reserve and on a much larger scale, after burning, in *D. strictus* areas in the Bwet and Nyanlè reserves. A description of the present condition of these sowings would be instructive.





Photo, J. W. Oliver.

Portion of a 6½-year old patch of Teak Sowings in flowered *Dendrocalamus strictus*,
BWET RESERVE, LOWER BURMA.

I attach a photograph, which is a reproduction of one taken in the early part of 1888, showing what was then a fair sample of the sowings in flowered *D. strictus* made in the Bwet reserve in 1881. The bamboos flowered in 1878 and the reserve was successfully protected from fire till the end of April 1881, when the whole of it was burnt. The fire was very intense and nearly all the saplings and low vegetation were destroyed ; teak suffered comparatively less than other species, except bamboos, but a large proportion of the younger classes were killed outright and even the larger trees were much injured. As soon as the rains began the ground became covered with a carpet of vegetation, principally bamboos and climbers with a good many seedlings of teak and other trees. Sowing and planting of teak was carried on throughout the whole of that rains, and after that sowings of teak and cutch for three successive seasons, those first undertaken being naturally the most successful. Similar sowings were also made in Nyanlè, the areas to be worked over being burnt in the hot weather before the sowing.

17th January 1905.

J. W. O.

THE REVIEW OF FOREST ADMINISTRATION IN
BRITISH INDIA, 1902-03.

From the remarks on fire protection in Burma in your "Review of Forest Administration of British India, 1902-03," I gather you are under the impression that no special staff is engaged during the fire season, but that the whole work of clearing, sweeping and patrolling in fire lines is done by the ordinary staff of forest guards. This is quite wrong. In some Divisions it is possible to get the lines cut by contract, and then the forest guard has to see that the work is being done according to orders, and that progress is sufficient to ensure its being completed by a certain date. In other Divisions contractors have so systematically robbed their coolies that the latter refuse to work except directly under the forest subordinates. Once the lines have been cut the sweeping and patrolling is occasionally done by contract, but more

generally by coolies engaged by the forest subordinates, as the beat officer has to be constantly travelling along his lines to see that the men are at work. It is impossible to say for what average length of line each forest guard or beat officer is responsible throughout Burma, but it is customary to allow one cooly for every two miles. In the Northern Circle in 1900 there were 1,400 miles of fire traces, which would necessitate the employment of 700 coolies as watchmen, and probably each beat officer is responsible for 15 or 20 coolies. Subordinates under the rank of Deputy Ranger are not as a rule permitted to disburse pay, so the senior subordinates have to be constantly travelling about the fire lines paying coolies. When the dangerous time for burning away from the fire lines arrives every subordinate is at his post, and for probably a month of constant anxiety nothing is thought of but fire protection. Leaves continue to fall right up to the rains, the beat officers have to be constantly on the alert to see that the traces are kept swept. The Burman cooly is not good at a sustained effort, and numerous cases have occurred in which the coolies have got tired and simply gone off home without a word to anyone. This year we are trying Chins in two Divisions, but as they have to be taught what to do and insist upon being paid every second day they can hardly be called a success.

H. S.

REVIEWS AND TRANSLATIONS.

REVIEW OF THE MINERAL PRODUCTION OF INDIA, 1898—1903.

BY T. H. HOLLAND, F.R.S.

We have been recently favoured through the courtesy of Mr. Holland, Director, Geological Survey, with a copy of his Review on Mineral Production in India. The subject is perhaps one not without interest to the Forest Officer, and we propose to give here some extracts from a Report which has proved most fascinating reading.

For the four years 1894 to 1897, a Review of the Mineral Production of India was issued annually by the Reporter on Economic Products; but in 1898 it was decided, owing to the want of uniformity in the rate of development of many minerals, to publish reviews of progress at wider intervals, covering periods sufficiently long to permit the determination of any decided secular variations in the mineral industry. The present Review, covering the period of six years, 1898 to 1903, is the first essay in this direction; but, in accordance with the orders of Government, five-year periods will be adopted for the future, and the Quinquennial Review of Mineral Production will be published in the Records of the Geological Survey of India.

In this Review the minerals are divided into two groups—

Group I.—Those for which approximately trustworthy returns are available; and

Group II.—Those regarding which definitely recurring particulars cannot be procured.

HOLLAND—MINERAL PRODUCTION, 1898-1903.

It has been possible in this report to now include the following in the first group :—Coal, Gold, Graphite, Iron-ore, Jadeite, Magnesite, Manganese-ore, Mica, Petroleum, Rubies, Salt, Saltpetre and Tin.

In the case of Gold, the most precise and elaborate details are obtainable for more than 99 per cent of the production, and approximate values are obtainable for the rest. For Graphite, accurate returns of quantity are obtained from the only company engaged in regular mining for the mineral. Although the returns sent in for the production of Jadeite and Mica are manifestly understated, both minerals are worked largely for export, and, as far as value is concerned, the export figures may be accepted as an approximate estimate of the trade in each case, whilst the nature of the error being known, the figures are not liable to be misleading. Manganese-ore has come into prominence since the older reviews were issued, and may now be transferred to Group I,

as the mineral is worked entirely for export, and the totals obtained from returns made by the District Officers agree very closely with those obtained from the ports. Rubies admit of the remarks applicable to Gold: the amount recovered other than by the Burma Ruby Mines Company may be neglected as an unimportant fraction of the total. Saltpetre and Tin are, with less certainty, entitled to places in this Group. For Saltpetre, the returns for production are evidently understated, being less each year than the quantity exported, but the export figures may be taken as only slightly less than those for the production of refined Saltpetre. The returns for Tin refer to two districts only in South Burma, but the estimates are probably more reliable than those for Iron.

This Review is directed primarily to a survey of the progress already made, and for anything approaching an idea of the material awaiting development the reader must consult the Manual of Economic Geology, now in course of revision by the Geological Survey Department. But besides the substances whose existence has been determined by the exploratory work to which a geological survey is properly restricted with regard to minerals of economic value the attention of prospectors might be directed to the minerals which have lately come into prominence through recent industrial developments, and which, in a country including the geological variety of India, are at present conspicuous by an absence that is probably only the result of absence of search. Amongst these are some minerals of the so-called rare metals, which, being generally of high specific gravity, should be searched for in the heavy concentrates of river gravels.

On looking over the returns for mineral production in India for the past six years, two features stand out most conspicuously. Firstly, there has been a remarkable progress in developing the few minerals which are consumed by what conveniently might be called direct processes, such as Coal, Gold, Petroleum, Gem-stones and Salt, or which are raised for simple export, such as Manganese-ore, Graphite, Saltpetre, Mica and Tin. Secondly, there has been an equally remarkable neglect of the metalliferous ores and the

minerals which are necessary to the more complicated chemical and metallurgical industries.

The principal reason for the neglect of metalliferous minerals is the fact that in modern metallurgical and chemical developments the bye-product has come to be a serious and indispensable item in the sources of profit, and the failure to utilize the bye-products necessarily involves neglect of the minerals which will not pay to work for the metal alone. Copper Sulphide ores are conspicuous examples of the kind: many of the most profitable copper mines in the world could not be worked but for the demand for sulphur in sulphuric acid manufacture, and for sulphuric acid there would be no demand but for a string of other chemical industries in which it is used. A country like India must be content, therefore, to pay the tax of imports until industries arise demanding a sufficient number of chemical products to complete an economic cycle, for chemical and metallurgical industries are essentially gregarious in their habits.

Graphite.—Amongst the minerals which have been taken up more seriously during the period under review, the Graphite of Travancore and the Magnesite of Salem in Madras are noticeable. The Graphite raised during the three years, 1901 to 1903, averaged 3,486 tons per annum, which is quite a serious item in the comparatively small market of this mineral. The total annual production of Graphite in the world varies between 70,000 and 80,000 tons, and the Indian output is thus about $4\frac{1}{2}$ per cent of the total quantity raised, but its value is not returned, and is estimated at £5 a ton.

Iron.—The works at Barakar still remain as the one successful attempt to manufacture Iron along European lines in India. Prospecting operations on an extensive scale have been carried on recently in the Central Provinces, the results in one area being unfavourable, and in the other undetermined. There is a general decline in the native charcoal-iron industry within range of the railways which distribute the cheap imported material, but in more remote parts of the Peninsula the old industry persists, and in parts of the Central Provinces has even improved. In the Sambalpur

District there are over 200 small direct-process furnaces still at work.

Magnesite.—Magnesite-mining was hardly established before the close of 1903, but preparations on a large scale are now being made to open up the well-known deposits near Salem, in which the mineral occurs in a condition of exceptional purity.

Manganese-ore.—The rapid rise of Manganese-ore mining is probably just now the most conspicuous feature in the mineral industry of India. Twelve years ago the industry had not definitely started, whilst last year India turned out a larger quantity of high-grade ores than any country except Russia.

Mica.—Although India is still the leading producer, and is supplying something like half the world's wants in Mica, the miner in India has not secured a satisfactorily large share of the recently increased trade in this mineral, and the returns for India show a smaller degree of expansion than those for consumption in Europe and America.

The returns of production for Mica grossly understate both quantity and value as both are below the export returns. As the only Mica on which royalty is charged is that raised in Government land, and as many Mica miners have mines in both zamindari and Government land, there are obvious reasons for understating the production, and, besides this fact, the flourishing industry of stealing Mica diminishes the returns for production without affecting the export figures.

A considerable quantity of Mica of the poorer grades is consumed in the country for ornamental and decorative purposes, and a small quantity of the larger sheets is used for painting pictures or in various parts of the country. As far as the figures for *quantity* are concerned, therefore, the exports cannot be accepted as an approximate expression of the production; but as regards *value*, the export returns may be accepted as a closer approach to the figures which should express production.

During the years 1897-98 to 1902-93, the Mica exported averaged 19,173 cwts, and had an average annual value of £77,613, or £4.05 per cwt. The variations in yearly value reflect a serious change in the trade which occurred in 1899.

In 1898 Indian Mica miners began to realise that their waste dumps contained a large supply of the material wanted for the manufacture of micaite, in which thin films of Mica are cemented together and moulded into sheets, to serve many purposes for which the natural sheets only were used formerly. The waste heaps were consequently turned over and the clear sheets of muscovite cleaned and split into thin films by gangs of children, who, by practice, could select the films of the required thickness with an accuracy which could scarcely be exceeded by the use of a micrometer. The large

quantities of "flimsy" Mica thus suddenly thrown on to the market raised the weight of Mica exported, without a corresponding increase of value.

During the years under review, the two chief producers contributed to the average total as follows:—

Bengal ...	... cwt. 12,282	valued at ...	... £52,272
Madras ...	... " 6,872	" ...	... £25,241

The average value out of the Mica sent out of Bengal was thus £4'26 per cwt., whilst that from Madras was £3'67.

The rules for the grant of prospecting licenses and mining leases for Mica in Bengal were revised in April 1902, and are printed *in extenso* with those of Madras in the Memoir of Indian Mica published by the Geological Survey in 1902. The important changes introduced in the rules were—

- (1) The levy of a royalty in the case of prospecting licenses at the rate of 5 per cent. on the sale value of Mica.
- (2) The abolition of the system of putting up leases of Mica mines to auction, and provision for restricting operators to approved methods.
- (3) The raising of the maximum period of leases to 30 years.
- (4) The grant of power to lessees to relinquish their grants during the currency of their leases

Of the prospecting licenses issued during the period under report, seven were granted in Nellore, four in Coimbatore, one in Godavari, and one in the Tinnevely district, Madras Presidency. In the Central Provinces, one was granted in each of the three districts Balaghat, Hoshangabad and Chhindwara. In Burma, one license was issued for each of the two districts of Magwe and Mandalay, and two each for Myitkyina and the Ruby Mines district. In Assam, one license was granted in the Khasia and Jaintia hills. In Rajputana four licenses were granted in Ajmer-Merwara, making a total of 27 licenses, covering 3,223 square miles.

Petroleum.—The Petroleum industry has increased at a greater rate even than coal-mining, in which in the six years under review the output rose from a total of 4,066,294 tons in 1897 to 7,438,386 tons in 1903, an increase of 83 per cent. From a production of just 19 million gallons of Petroleum in 1897, the output rose to nearly 88 million gallons in 1903, and in addition to the export considerable quantities of paraffin wax, the illuminating oils and petrol refined in Burma and Assam have at last shown signs of definitely displacing foreign supplies in the Indian market.

Rubies.—During the period under review the Ruby-mining industry in Upper Burma underwent a new and favourable phase, the mineral having become, next to the petroleum, the most profitable source of revenue amongst Burmese minerals. Various leases were granted in the Ruby-bearing area near Nanyaseik in the

Myitkyina district, and the "stone-tract" of the Sagyin hills in Mandalay district, and the results have been mostly profitless; but the returns for the Mogok area, where the Burma Ruby Mines Company is paramount, show that the industry has entered a most encouraging phase. The Company was granted the right in 1889 to mine for Rubies and to levy royalties from persons working by native methods, the lease being renewed in 1896 for 14 years, at a rent of Rs. 3,15,000 a year plus a share of the profits. The results being, however, unsatisfactory from the shareholders' point of view, the rent was reduced in 1898 to Rs. 2,00,000, the share of the profits being, at the same time, raised from 20 to 30 per cent. A dividend of 5 per cent was paid for the first time in 1898, when the value of the Rubies obtained amounted to £57,950.

Tin.—Although Tin-mining in South Burma is still practised on a small scale, there has been a marked improvement in the returns, and the persistently high price of Tin is likely to inspire more enterprise in the exploitation of these deposits, which are a natural continuation of those in the Malay Peninsula, from which more than half the world's supply is obtained.

Amber.—The returns for amber show the irregularities which might be expected of an industry conducted in a casual fashion by the half-civilised inhabitants of an unadministered area. The Burmese diggings for amber are situated in the Hukong Valley in the Nangotaimaw hills near Lalaung village. The substance is found in clays of probably miocene age, and fragments of amber have been similarly found in association with beds of this age in other parts of Burma, *e.g.*, at Mantha in the Shwebo District, and on the oil-field of Yenangyat in the Pakokku District. Most of the material is brought from the Hukong Valley in Upper Burma to Mandalay, where beads of rosaries, *nadaungs* (ear-cylinders) and other trinkets for personal ornaments are made from the transparent varieties. The amber of Burma differs in chemical and physical characters from previously known varieties, and the name *burmite* has been consequently suggested for it. The well-known amber of Eastern Prussia contains from $2\frac{1}{2}$ to 6 per cent of succinic acid, and is consequently known to the mineralogist as *succinite*, but the

Burmese amber contains no succinite. It is distinguished from many other amber-like resins by its superior hardness and greater toughness, which render it fit for carving and turning. Apart from the occurrence of a large percentage of discoloured and opaque pieces many of the large fragments obtained are damaged by cracks filled in with calcite; but otherwise there appears to be a large quantity of material which might be put on the market with profit. At present it is said to be unable to withstand the competition of imported Prussian amber, even in the Mandalay bazar, and the market has to a certain extent been depressed by cheaper foreign material and by an artificial substance re-made from amber chips.

Clays.—No statistics approaching completeness are obtainable to show the extent of the great industrial value of the clays in India. They include the common clays used all over the country for the manufacture of bricks, tiles and the cheaper forms of pottery; finer varieties used for glazed pottery, which in places has obtained a reputation for artistic merit; fire-clays raised in considerable quantities on some of the Gondwana coal-fields; and fuller's-earth, which is mined in the Central Provinces and in Rajputana.

Diamonds.—Notwithstanding the reputation (stretching back even as far as Ptolemy in the European, and further in the Hindu, classics) which India has held as a diamond-producing country, the output of to-day is very small and comparatively unimportant. The places which, according to accounts, have been most productive in the past form three great groups, each in association with the old unfossiliferous rocks of probably pre-Cambrian age now known as the Purana group, and distinguished locally as the Cuddapah and Kurnool systems in South India, and as the Vindhyan system in the northern part of the Peninsula.

The southern of the three groups of diamond occurrences includes localities, with apparently authentic records, in the districts of Cuddapah, Bellary, Kurnool, Kistna, and Godavari. Loose stones have been picked up on the surface of the ground, found in deposits of alluvium and in workings which have been undertaken in this so-called Banaganpilly stage of the Kurnool series of strata. In

the second group of occurrences in the Mahanadi Valley, the stones have been found in the alluvium of the Sambalpur and Chanda Districts, and though strata similar to those of the Vindhyan and Kurnools are known in this area, no diamonds have been found in these older rocks. The third group of occurrences occupies a tract some sixty miles long by ten wide, with the Vindhyan conglomerates near Panna as the centre. The diamond mining industry still persists in this area both in the old conglomerate of Vindhyan age, and in the deposits which, though described as alluvium, are possibly relics of Lameta (Upper Cretaceous) deposits.

THE NEW BOARD OF AGRICULTURE.

It will not be news to many of our readers that the Government of India have recently constituted a Board of Agriculture. The duties of this Board are, we believe, solely connected with agricultural matters; the improvement of agricultural methods by the introduction of higher quality seed grains and roots, by the adoption of up-to-date machinery and implements, by experimenting with soils and fertilising manures, and finally by the economic study of plant and animal diseases of the crops. The Board has also under consideration a system of agricultural tuition with a view to the distribution throughout the country of men trained in the science of the subject. That such a Board was greatly needed in the Empire is beyond dispute, and the good results that will ensue from its work are almost incalculable.

The first meeting of the Board took place at Pusa on January 6th and following days under the presidency of Mr. F. G. Sly, Officiating Inspector-General of Agriculture, the Revenue Secretary to the Government of India, Mr. J. Wilson, C.S.I., being present as a visitor.

We have been favoured with a copy of the report of the various matters considered at the meetings, drawn up by the Secretary, Dr. E. J. Butler, Cryptogamic Botanist.

The first day was devoted to a consideration of the proposed Programmes of work of the staff of the Agricultural Department.

On the second day questions connected with irrigation, veterinary science (cross-breeding of cattle), and the extension and improvement of cotton were discussed. Cotton cultivation was also the subject dealt with on the following day. The fourth and fifth days were devoted to a consideration of the Publications to be issued by the Department, with measures to bring the Imperial experts into closer touch with the Provincial Departments of Agriculture, and the latter into closer touch with agriculturists and with agricultural education.

We congratulate the Board on their decision to publish a quarterly Journal on general agricultural subjects and in addition to issue separate Scientific Memoirs; and we trust that the day is not far distant when the Forest will be in a position to follow in the footsteps of its sister Department in this respect.

SHIKAR, TRAVEL AND NATURAL HISTORY NOTES.

ANOTHER SHIKAR INCIDENT.

About six months ago I ventured to give my views on "Shikar" literature in general whilst describing a 'curious incident.' It may be remembered that the incident was consequent on the coming of the Conservator to my Division. Strangely enough the events about to be narrated also occurred immediately following the arrival of the Conservator at the very same camp. McEluire has departed, but Snowden reigns in his stead. It will add interest to the details if I state first the moral of the story. It is this—never be certain who shot an animal until you have examined the bullets inside it. I have often seen a dispute settled in this way, but never before have I heard of the casual extraction of a bullet proving to two men, who were perfectly agreed as to the ownership of a trophy, that they were both quite mistaken.

We were seated over the breakfast table when some one rushed in to say there were "cheetal" in the compound. I went out and saw a large herd of these animals rushing across the far end of the

compound towards the forest, but on arriving at the edge, they stopped and stood gazing at the camp, presenting a grand sight with beautiful skins and swaying forest of horns. There were over a dozen stags and at least nine good heads. I stood watching them while a rifle was being put together, but as it reached me, a shot from Snowden on the other side of the house bowled over one of the herd and the rest disappeared into the forest. Unfortunately the slain animal proved to be a small stag that had pushed itself into the way at the wrong moment; the bullet, a nickel-coated expanding one from a .400 cordite rifle, had passed clean through its neck. I went into the forest after the herd, and before long got a shot at a fine stag, with a small .400 bore rifle firing a solid lead bullet. As I fired, the animal moved, the cover was thick, and as there was no indication to the contrary I concluded I had missed and returned to camp. On my arrival I was informed that the big stag that Snowden had aimed at had been seen to go away wounded and that a blood track had been found. Men were sent to follow the trail and I settled down to work. About two hours later I was informed by the same trackers that a wounded stag was sitting down close to the camp, and I went out with my .450 express, thinking to polish off Snowden's stag. I came on a pool of blood within 50 yards of the elephant's camp and soon afterwards saw the stag. It immediately got up and was disappearing among dense bushes when I fired into its hindquarters and brought it down. To my surprise I found only one wound on it, and that an enormous rent in the hindquarters. I could only conclude that my bullet had struck it in the same spot more or less as Snowden's. I informed Snowden that I had brought in his stag and went off for another stalk. On my return Snowden produced the base of a bullet which I recognised at once as my .400 solid and remarked "I couldn't find any trace of my cordite express bullet, but here's the one you polished it off with." I stared in amazement, "but," I said, "I polished it off with my .450 express." Then an enquiry elicited the fact, quite unknown to me, that the stag I finished off was found quite by accident and not by the blood trail, which had been lost, and that it could be none other than the stag I thought

I had missed with my first shot and the solid bullet. Snowden, hearing me declare positively that I had missed my stag and thinking that I had used my solid bullet on both occasions, was naturally as certain as I was that the stag brought in was his.

SOHELWA.

EXTRACTS FROM OFFICIAL PAPERS.

OBITUARY.

It is with the deepest regret that we have to announce the death at Akyab on March 12th of Mr. H. Slade, O.S.W.E., Conservator of Forests, Burma, from the effects of cholera. Mr. Slade had but recently made over charge of the Northern Circle, Upper Burma, and left Maymyo fit and well. He was deputed to inspect Akyab and the Andamans, and left Rangoon for the purpose on March 2nd. We trust in a later issue to give a history of his services together with the Lieutenant-Governor's notification deploring the loss of Mr. Slade's valuable services to his administration.

THE EROSION OF THE HILLS TO THE EAST OF THE SITTANG RIVER, BURMA.

The subjoined extracts from diaries of officers serving in the Tenasserim Circle appear to me to be of sufficient importance and general interest to be recorded in the pages of the *Indian Forester*. The hills affected are those east of the Sittang River in Lower Burma. The reservation of forests has been almost completed in the Pegu Yoma, but the hills east of the Sittang have hitherto been abandoned to the *toungya* cutter. The damage which is likely to result from this cause is foreshadowed in the passages quoted. Mr. Rorie does not advocate reservation because the *toungya* cutters have nowhere else to go. Perhaps

he has not seen the devastation caused by torrents, in the Basses Alpes for example, or in Provence, and has not read such works as those of MM. Demontzey and Surell, and so does not realise the importance of maintaining a dense covering of well-managed forest on the hills to regulate the flow of water in streams.

It has of late years been found that this is a very important matter from the point of view of irrigation, and as a source of electrical energy, permitting the development of industrial enterprises in mountainous tracts where formerly shifting cultivation and pastures were the chief, if not the only, resources of the scanty population.

In the *Revue des Eaux et Forêts* for the 1st December 1904, an article on this subject is given, as an extract from *l' Industrie électrique*, wherein waterpower is picturesquely and suggestively named "la houille blanche." This article is well worth reading. It shows that in nature there are three sorts of regulators of streams, *viz.*, glaciers, lakes, and forests. It is pointed out that the last are much more frequently met with than the other two, and that they act not only as regulators of the flow of water but condense the moisture of the air and bring about its precipitation, the rain of our land in due season, the first rain and the latter rain which is so important for agriculture.

Sometimes one meets with people in authority in Burma who question the necessity of the reservation of the forests for climatic reasons in Lower Burma, on the ground that this country enjoys an abundant and regular rainfall, and that jungle comes up again as soon as it is cut down. They seem to think that "ponzoh" (the re-growth of forest on an abandoned toungya or hill clearing) is quite as good as a completely stocked and well-tended high forest. Foresters, however, know that clean fellings should not be made on unstable hillsides subject to heavy rainfall, but that the system of "high forest" should be adopted, and the method of treatment be that known as "*jardinage*" or selection fellings. But the toungya cutter not only makes a clean felling (as nearly as possible) but also burns the cut material as completely as he can. Deep ravines are formed on these clearings during the rains,

and the silt carried down from them greatly increases the erosive action of the streams and their power of sweeping onward gravel and boulders.

I hope that the facts recorded in the diaries which I quote below will convey a hint that torrents are likely to form and the rainfall to become irregular even in Lower Burma, if care is not taken to restrict the operations of toungya cutters. It is a question of whether they should be allowed to cause devastation, ruin, and death to suddenly overtake the inhabitants of the low lands and sterilise fertile lands which pay far more revenue to the State than do their own miserable "jhums."

RANGOON :

F. B. MANSON.

January 1905.

EXTRACT FROM THE DIARY OF THE DIVISIONAL FOREST OFFICER,
SHWEGYIN, FROM 1ST TO 22ND AUGUST 1904.

On the night of the 7th August unprecedented floods occurred in the Shwegyin Chaung (stream), lasting till the 9th. Monster trees, chiefly whitewood and thitkado (*Cedrela serrata*) were brought down with all the bark completely peeled off. A female rhinoceros, dead, was floated to Shwegyin, as well as cattle, fish, pigs, a bear, fowls, some houses, etc. The water was thick like pea-soup. It is quite evident that some large hill or hills have slipped down. No definite information has been received yet.

The Divisional Forest Officer was written to on the 5th October 1904 and asked to submit a report. The circle "thugyi" was sent to investigate and report. He reported to the effect that on the 10th August heavy rain at the headwaters of the Madama Chaung caused a big flood, which washed away all the houses and property on its banks. Big landslips occurred in the Thabanhlaing, Mayet, Maikah, Hteela, Maikade, Hlaypha and Hteephodoe hills. Seven houses in the Hteela village were destroyed, but no one was killed. Taungyas and gardens were destroyed and many trees, e.g., Thitpyu, Taungkathit (*Erythrina stricta*), Thitkado, Kywedanyin (*Ormosia robusta*) and other species. The landslips are supposed to have been caused by the heavy rain coupled with springs which had started along the sides of the hills.

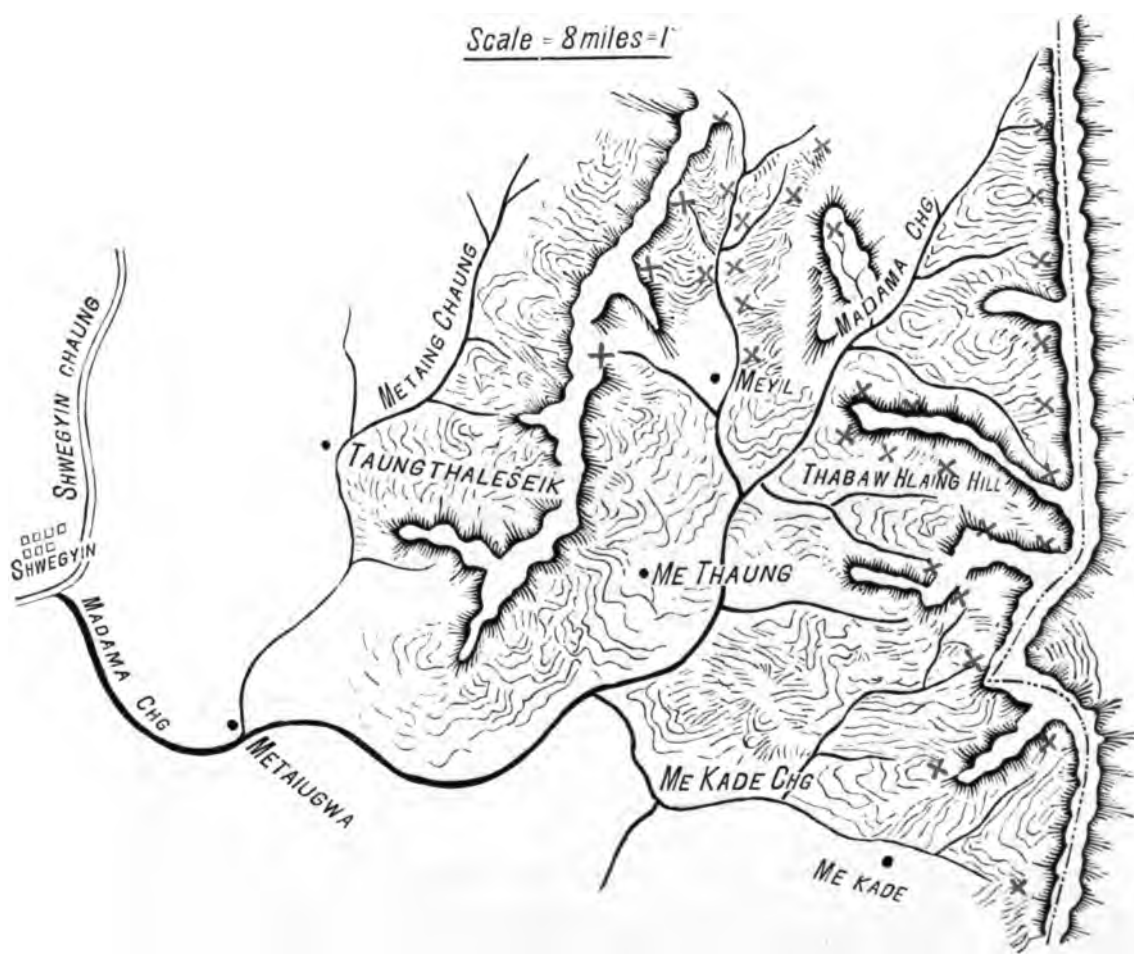
The area was visited by the Divisional Officer (Mr. Rorie) in company with the Township Officer (Mr. Shircore) early in December, as the villagers who had suffered had applied for a remission of revenue. Mr. Rorie's diary for the week ending 11th December—entry for 7th to 9th—gives a detailed description of the landslips. According to Mr. Rorie, the landslips seem to be confined to the Shwegyin River drainage (*vide* map; those in the drainage of its feeder, the Madama Chaung, are too numerous to be counted. These slips are on the steep slopes on both sides of small ravines on the sides of the hills. The soil on the highest hills is generally a white, coarse, gravelly sand with a thin covering of humus, and containing boulders of all sizes. The rock formation is granitic and of a sort which quickly disintegrates on exposure. The slips are mostly fan-shaped and usually about 30 yards wide at the base, though bigger ones were also seen. The cause of the landslips, Mr. Rorie thinks, is the heavy rain aided no doubt by taungya cutting; but in some cases slips occurred where there were no taungyas, and in others the slips started some 300 yards above the taungyas. The Karens state the rain was exceptional, and that springs appeared in many places on the hillsides. Although it is probable that many of these slips will increase in size during the next five years, the Divisional Officer does not advocate reservation as the villagers have no other land for taungya cultivation.

EXTRACT FROM THE DIARY OF W. G. COOPER, ESQ., EXTRA ASSISTANT
CONSERVATOR OF FORESTS, WEST SALWEEN DIVISION, FOR THE WEEK
ENDING 13TH AUGUST 1904.

10th.—Very heavy rain fell all night, and this morning as I was about to shift my camp to Zeebyoung, the Kyunpago Chaung began to rise. In a short while the water came over the bank in a sort of wave and continued to rise. The temporary bamboo bridge over the stream was washed away, and before long a big zayat, the forester's quarters, and some bazaar stalls were also washed away. Some of the property from these stalls was brought to the forest bungalow and kept under the house. The water continued to rise, and it was with some difficulty that I managed to take some of my things into the village; the rest had to be left in



Scale = 8 miles = 1"



SKETCH MAP SHOWING ROUGHLY
THE POSITIONS OF THE LANDSLIPS
IN THE MADAMA DRAINAGE

REFERENCES

District Boundary -----

Landslips X X X

J. J. RORIE, *del.*



the house. It was found that the water had risen a foot and a half inside the house. The total rise of the river was about 17 feet above the average water level. The Karens tell me that this is about the biggest flood they have ever had. The latrine and cook-house attached to the bungalow were also washed away, and some of my things drifted out of the house and were found in the jungle close by. The bazaar people lost all they had. Before the river rose so rapidly there was a distant sound of thunder or of rolling stones, and some said that there was a landslip higher up the stream.

MISCELLANEA.

PIONEERS OF INDIAN FORESTRY.

DR. HUGH CLEGHORN'S SERVICES TO INDIAN FORESTRY.

BY SIR DIETRICH BRANDIS, K.C.I.E., F.R.S.

I have read with great pleasure the notices which have lately appeared in the *Indian Forester* of the *Pioneers of Indian Forestry*, and it has occurred to me that some of my young friends may like to read what I wrote in 1890 (Transactions of the Royal Scottish Arboricultural Society, XII—87) regarding my late friend Dr. Cleghorn.

KEW :

D. BRANDIS.

December 1904.

Since Forestry is now recognised as an important business in India ; since it has become possible, by means of protection, and chiefly by means of protection against the annual ravages of fire, to convert the poor jungles of olden days into dense, well-stocked and productive forests, which yield a large and steadily increasing revenue—and mainly since experience has shown that Forest Conservancy, instead of doing harm to the people of India, promotes their well-being, and is a blessing to them and their country—the question has, naturally, often been asked and discussed, in

which part of the British Indian Empire was Forest Conservancy first started?

In the beginning of the nineteenth century the Government of Bombay established a timber agency on the western coast of the Peninsula, in order to secure a permanent supply of teak timber for the Government dockyards at Bombay. In 1847 Dr. Gibson was appointed Conservator of Forests in Bombay, and ever since that time attempts have been made, with more or less success, not only to work the Government forests of that Presidency, but also to secure their maintenance, to protect and to improve them.

Soon after Tenasserim had become British territory in 1826, repeated, but at that time mostly ineffectual, attempts were made to effect the protection of the teak forests in that Province.

In the Presidency of Madras, Mr. Conolly, the Collector of Malabar, commenced (1843) planting teak on a large scale at Nilambur, and this was the beginning of those famous plantations which have since been steadily extended by the Madras Forest Department, and which are now reported to cover 3,500 acres.*

The object of the present paper is not to decide the question whether Madras or Bombay may claim the honour of having first started Forest Conservancy in India, but to set forth the share which Dr. Cleghorn has had in this business; and hence it will be necessary to review somewhat more fully what was done in this respect in the Madras Presidency, where Dr. Cleghorn commenced his labours.

In May 1847 Captain Frederick Conyers Cotton (Major-General and Companion of the Star of India†) reported to the Government of Madras on the teak in the Anamalai Hills, and asked for the services of an officer to explore the forests. The sanction of the Government of India having been obtained to this proposal, Lieutenant James Michael (now Major-General and Companion of the Star of India) was appointed in June 1848.

* Over 1,800 acres have been added to the area of the plantations since 1890.—
HON. ED.

†He died in 1901—see *Indian Forester*, XXVIII, 243

In August 1849, the Court of Directors called for reports on the results of Lieutenant Michael's work. The terms of the despatch are well worth recording, as evidence of the just views entertained at that time by the Court of Directors. They wrote: "We trust that effectual measures will be taken for its conservation (of the Anamalai Forest), so as to protect it from the serious injury which other forests have sustained."

Captain Cotton then submitted a report on the operations of felling and converting teak, the making of a road across the hills, and the settlement of the Colengode and Cochin boundaries. He also reported the number of good teak trees standing—

In the Cochin disputed territory	...	...	107,000 trees.
In the Colengode	..	...	28,000 "
In the Government territory	...	...	61,700 "
Total			196,700 "

Minutes were written on the subject by Mr. D. Elliot, Member of Council, and by the Governor, Sir H. Pottinger, and in February 1850 the Government sanctioned Lieutenant Michael's services being retained. In February 1851 he was sent to Moulmein to learn the methods of dealing with heavy timber, in December 1853 to the Kanara Forests, and in 1854 he was formally appointed Superintendent of the Anamalai Forests. The published reports (selections from Madras Records No. V. of 1855) deal only with timber and roads, and there is no reference to conservancy. Lieutenant Michael, however, did more than this—he brought about the lease of valuable teak forests from the Nambadi of Colengode, and he started a system of clearing teak seedlings, and young teak trees, of dry leaves and other inflammable matter in the forests, so as to protect them against injury by the annual fires of the dry season.

In 1856 Lieutenant Michael went on leave, and Captain (later General) Douglas Hamilton was appointed in his place. He was in charge of the Anamalai Forests for several years, and at a later date—after a regular Forest Department for the whole Presidency had been organised—Captain Hamilton was succeeded by Lieutenant (now Colonel) Beddome.

About the time that Captain Cotton first drew attention to the Anamalai Forests, Dr. Cleghorn was stationed as an Assistant Surgeon at Shimoga, in the Nuggur Division of Mysore. Being interested in botany and a keen observer, he remarked the wholesale destruction of forests in that district, chiefly through "Kumri" cultivation. It was mainly through his representations that the attention of Sir Mark Cubbon, then Commissioner of Mysore, and of Colonel Onslow, the Superintendent of the Nuggur Division of that State, was drawn to the necessity of Forest Conservancy. Dr. Cleghorn's name is mentioned in a Report on the Conservation of Forests, which the last-named officer submitted to the Commissioner in May 1847.* In consequence of this report and of Dr. Cleghorn's representations, Kumri cultivation was stopped in the greater part of Mysore and Coorg; and in 1868, while on a tour of inspection through these districts, the writer of this paper had the satisfaction of seeing large tracts of country clothed with well-stocked young forests, which had grown up on the old Kumri clearings.

In 1850, the British Association for the Advancement of Science, at their Edinburgh meeting appointed a Committee to consider the probable effects, in an economical and physical point of view, of the destruction of tropical forests. The report was drawn up by Dr. Cleghorn, and was submitted to the Association, which assembled at Ipswich in 1851. The other members of the Committee were: Professor Forbes Royle, Captain R. Baird Smith, and Captain (now Lieutenant-General) Sir Richard Strachey. The report gave an exhaustive review of the question as it then stood, and as far as it related to India, and it contributed much to induce influential members of the Government in India and at Home seriously to consider the necessity of organising systematic measures of Forest Conservancy in India.

In the Bengal Presidency it was Lord Dalhousie himself who, as Governor-General of India, carried through effective measures for the conservation of forests, chiefly in the newly-acquired Province

* Report of the Twenty-First Meeting of the British Association held at Ipswich in July 1851, p. 83.

of Pegu ; while in Madras Lord Harris took steps in the same direction. In August 1856, Dr. Cleghorn submitted a report to the Government of Madras, containing proposals for establishing Forest Conservancy. These proposals were sent up to the Government of India for sanction, which was accorded in November ; and on the 19th December 1856, Dr. Cleghorn was appointed Conservator of Forests in the Presidency of Madras. An account of the work accomplished during the first five years of his tenure of this appointment is contained in three general reports and other official documents, which, with other important unofficial papers, will be found in a little book entitled *Forests and Gardens of South India*, published by Dr. Cleghorn in 1861, when compelled to come home on sick leave. This book has done much to promote Forest Conservancy in India. The reader must not expect to find in it the record of a complete and scientific system of forest administration, the introduction of which, under the circumstances at that time, would not have been feasible. But the record of the work accomplished by Dr. Cleghorn during this period shows that he directed his attention to such matters as called for immediate action, and that his recommendations in regard thereto were in the right direction. He justly laid great stress upon the necessity of acquiring a good knowledge of the principal trees and shrubs, as well as of the climate, soil, and forest growth in the different forest tracts ; he arranged for the supply of timber, charcoal, and firewood ; and in regard to the protection of the forests, he studied the chief sources of injury, indiscriminate cutting, fires, and Kumri cultivation. The result of his persistent representations was that, by an order of May 1860, the Government of Madras prohibited Kumri cultivation in Government forests without previous permission, and directed that this permission should be given sparingly, and never for spots in the timber forests. Dr. Cleghorn had thus accomplished for the Madras Presidency the same result which, thirteen years previously, he had helped to bring about in Mysore, and in both cases the result accomplished through his persistent representations has been most beneficial for the country and its inhabitants. Dr. Cleghorn was able to carry his point in

this matter, because he was known to be a true friend of the natives ; he entertained feelings of warm sympathy towards them, and had made himself familiar with their mode of life and system of husbandry. As a medical man his name was widely known, and he had acquired much influence among the native population. When urging the discontinuance of Kumri cultivation in Madras as he had previously urged in Mysore, he knew that he was proposing measures which in the end would be highly beneficial for the people themselves. Dr. Cleghorn's single-minded desire to promote the welfare of the people was known to those who at that time were in influential positions in Madras, and the confidence which they placed in him was the secret of his success in this important matter.

At a later period Kumri was unfortunately again permitted in Mysore, and in Madras the beneficial effect of the order of 1860 has subsequently to a great extent been rendered nugatory by the tendency, which for some time prevailed in that Presidency, to regard as private property a large portion of the forest lands, particularly in South Kanara, that had formerly been considered to be the property of Government. These subsequent mistakes, though they have done great injury to the country and its inhabitants, do not in any way diminish Dr. Cleghorn's paramount merit in this matter. He paid great attention to a proper arrangement of cuttings, so as to secure the maintenance and promote the natural reproduction of the forests. Under his direction numerous new plantations were established, while existing plantations were maintained and extended. Establishments for the protection and proper management of the forests were organised in all districts. The time had not yet come for comprehensive forest legislation, but local rules were issued by Government on his recommendation, which for the time being were sufficient.

On Dr. Cleghorn's return to India in November 1861, he was directed by the Governor-General in Council to proceed from Madras to the Punjab, in order to examine the forests in the Western Himalaya, with a view to obtain reliable information regarding the timber resources of that Province, and to institute

a systematic plan of conservancy and management. The exploration of the forests in the hills occupied the summer months of 1862 and 1863, while the winter months were devoted to the inspection of timber depôts, brushwood tracts of the plains and the preliminary arrangements necessary for the formation of the Department. His Report on the Forests of the Punjab and the Western Himalaya, which was published in 1864, sets forth the results of his work, and has been of great value in facilitating the organisation of forest administration in that Province and in those Native States of the Western Himalaya where it was possible, by means of leases, to obtain the control of the forests. His work received from the Lieutenant-Governor of the Punjab great praise, and the Governor-General in Council expressed his concurrence in the high estimation entertained by the Punjab Government of his services.

Meanwhile (in October 1862) the writer of the present paper had been summoned from Burma, where he had been in charge of the forests since January 1856, to advise the Government of India in the general organisation of Forest business. On his recommendation, Dr. Cleghorn was associated with him on the 1st January 1864, and remained in that capacity attached to the Government of India until 1st March 1865. Previously, in August 1863, these two officers had drawn up a joint memorandum, which was sent to the Government of Madras, and which urged the necessity of early demarcation of the Government and village forests in the Madras Presidency. These proposals were not, however, at that time approved by the Madras Government, and it may here be added that, in spite of the persistent representations subsequently made on the same subject by the Government of India, no adequate action was taken in Madras towards effecting a separation of the various rights and interests in the public forests and waste lands until the Madras Forest Act was passed in 1882.

In April 1866, while the writer of the present paper was on leave in Europe, Dr. Cleghorn was appointed to officiate as Inspector-General of Forests until April 1867, when the thanks of the Government of India were conveyed to Dr. Cleghorn for his

long and successful labours in the cause of Forest Conservancy in India. On his return to Madras, he resumed his work in that Presidency with his former zeal and industry. That, nevertheless, during that period much less progress was made in the forests of Madras than in those of other Provinces of the Empire was due to the views of the Government of Madras, which at that time began to manifest themselves. Dr. Cleghorn retired from the service in 1870, but has since been employed every year at the India Office as a confidential adviser to assist Her Majesty's Secretary of State in the selection of candidates for the Imperial Forest Service.

When Dr. Cleghorn laid the foundation of an effective system of Forest Conservancy in Mysore and Madras, Forestry was very little known in India. A commencement had been made in several places, but Dr. Cleghorn was the first to carry out conservancy measures on an extensive scale. His aims were large and comprehensive, but the single-minded devotion to the task which he had set himself gained the confidence of many who might otherwise have been hostile to the new measures advocated by him. A public resolution by the Government of India, of 10th January 1865,* justly designated him as the founder of Forest Conservancy in India, and added—"His long services from the first organisation of forest management in Madras have without question greatly conduced to the public good in this branch of the administration; and in the Punjab also Dr. Cleghorn's labours have prepared the way for the establishment of an efficient system of conservancy and working the forests of that Province."

Since Dr. Cleghorn's retirement from the Indian Service, he has done much for the promotion of Forestry in Great Britain, particularly through the Royal Scottish Arboricultural Society, of which he became a Member in 1865, and of which he has been President on two occasions—from 1872 to 1874, and from 1883 to 1886. It was in a great measure due to his exertions that the International Forestry Exhibition of 1884 was held with such marked success at Edinburgh.

* Parliamentary Return on Forest Conservancy, Part I, India, 1871 p. 95.

LOSSES FROM FOREST FIRES IN THE ADIRONDACKS
IN 1903.

The following extract from a publication issued by the United States Bureau of Forestry is of interest:—

The fires caused no loss of human life, although several narrow escapes occurred. A few domestic animals are known to have been killed.

For the game the results were more serious. The breeding and nesting season was at its height, and for this reason there must have been great loss of weak young animals and birds. The bodies of several deer were found. The trout suffered severely. In a number of towns dead fish were seen floating down the streams. In one case several bushels of fish were found washed up on the shore of a lake near an inlet. Along the West Branch of the Ausable River considerable destruction took place. On the Boquet River, two boys waded the streams and in a single day took 92 brown trout, weighing 74 pounds. The fish seemed hardly able to move, and were easily caught in the hands. In shallow streams the heat alone was probably sufficient to kill the fish. In deeper streams it seems more likely that lye leached from the wood ashes, or the finely divided ashes themselves, had a poisonous effect. In this connection the after-effects of fires on trout streams must be taken into account. Trout require clear cool water. The loss of heavy shade and the washing of impurities from burned areas into the mountain brooks cannot but have an unfavourable effect on the fish.

The aggregate value of property destroyed, as reported from the best attainable source, amounted to a total area of \$ 1,131,990.

This comprises standing timber, logs, lumber, pulp wood, fire wood, tan bark, logging camps, houses, barns, hotels, cottages, sportsmen's camps, bridges, and fences—all of these items are estimated at the commonly accepted value placed upon them in their locality. This varies considerably in the case of forest products, according to the varying expense of transportation to market more or less accessible localities. In

estimating the total loss, the following considerations have been borne in mind :—

(1) The total area injured by fire has not been considered as a basis for this report but only burned-over lands within the Adirondack Park and its immediate neighbourhood.

(2) The constant and evident tendency of corporations and heavy landowners within the area canvassed was to minimise their losses—no doubt for excellent business reasons. One large Paper Company, which was known to have lost heavily, declined to give any information.

(3) No allowance has been made for the considerable difference in value between lands in private preserves and the rest of the Park. This difference is created by special use to which the land is put, but is none the less actual and marketable. Land which is of practically no value for timber may be worth \$25 an acre when included in a preserve. But it is worse than useless when burned over, since its ugliness depreciates the parts of the holding which may have been saved from the fire. A number of the Adirondack preserves were badly burned this year. The manager of one of them gives his loss as \$225,000, though the actual commercial value of timber destroyed was probably not over \$40,000.

(4) Damage to reproduction, or the young forest growth, should be considered a heavy loss, since upon it depends the forest of the future.

It will be seen that the accurate determination of the losses is an impossibility. The figures form a basis for an estimate of the actual money loss, and these are known to understate the damage which was inflicted. The careful consideration of these data and of the modifying considerations mentioned has resulted in the belief that the total damage and resulting loss is not less than \$3,500,000.

METHODS EMPLOYED IN FIGHTING THE FIRES.

In New York the official care of the State's interest in the Adirondack and Catskill forests, and the administration of the Adirondack and Catskill preserves, are under the direction of a

Superintendent of State forests. A Chief Fire Warden has charge under him of all matters of fire protection and prosecution of offenders against the fire laws. Both of these officers are appointed by the Forest, Fish and Game Commission. The Commission also appoints a Fire Warden in each forest town, upon whom rests the responsibility of fighting all fires within his territory. The towns are usually divided into convenient districts, each of which is guarded by a Deputy Warden. These Warden Officers are empowered to order any able-bodied man out to fight fire, and have full direction of the work. The State shares equally with the town in paying for such labour if the Warden certifies that the work was authorised by him and was actually performed.

Had there been no such organisation the losses of this year would have been much more severe and extensive. In the main the wardens showed intelligence and zeal in the performance of their duties, and made a gallant fight against odds which were frequently overwhelming. In some cases they and their men worked fifteen hours a day for a number of consecutive days, some to be prostrated later by sickness following the long strain and complete physical exhaustion. The various communities and the State owe such men a debt which pay checks cannot cancel. The blame for the avoidable loss lies rather with the system than with the men.

The most effective fighting was done from daybreak until about 9 o'clock in the morning. The fires were usually much deadened at this time of day, and the wardens took advantage of the fact, resting their men or acting chiefly on the defensive in the middle of the day, and renewing the attack towards evening when the fires again lost some of their aggressiveness. Surface fires were checked by raking away the litter on the forest floor in a path a few feet wide, which served as a line of defence from which the fire could be fought back as it approached. When water could be obtained the path was thoroughly wet down. Shovelfuls of sand were dashed upon blazing wood. Burning grass in the clearings was thrashed out with the bushy top of a young spruce or balsam, or a few furrows were turned with a plough across the track of the fire.

But usually the presence of duff made it necessary to dig a trench from one to four feet wide down to the mineral soil, sometimes completely encircling the fire. The roots were cut through with axes and mattocks, and the mass of petty material chopped up and shovelled out. Often the sand was heaped against the outer side of the trench to protect the duff from sparks and heat when the fire burned through the inner side. Several wardens report digging 15 to 20 miles of such trenches.

When other methods failed or could not be used, the wardens resorted to back firing. Often the fires became crown fires, or were of such volume and heat that men could not approach them. In such cases trenches were prepared, and fire was applied all along the side next the approaching forest fire. If the trenches could then be defended successfully for a short time, the fires thus set would burn a distance back from the trench, thus clearing away much of the combustible matter and robbing the conflagration of its energy when the two lines of fire finally met. Most of the wardens who employed this expedient report good success in its use, and some say that without it they could have made no effective defence at all.

These methods were fairly successful as long as enough help could be had and there was no strong wind. But about May 28th to June 3rd (the latter being the worst day) high winds occurred in the Adirondacks, fanning smouldering fires into activity. As a result fire fighting became generally ineffective; the woods became so hot and smoky that everyone was compelled to take refuge in the clearings and to confine his efforts to an attempt to save the threatened cottages, camps, hotels, and farm buildings. The destruction of the entire region seemed not at all improbable, for in the dense pall of smoke it was impossible to tell where the fires were. In some localities these unseen fires could be heard distinctly, and the nights were almost as bright as the days from the glare. People frequently slept on the floors to avoid the smoke.

It was only the timely appearance of heavy rains, beginning June 7th, that brought the fires under control. Hundreds of men

dropped their tools that day and slept the sleep of utter physical exhaustion. Another week of strain would have beaten down all defence.

Fire fighting had been carried on practically without cessation for six weeks. It cost the State, local authorities, and corporations, taken altogether, somewhere in the neighbourhood of \$175,000. Each town must pay one-half its authorised fire bill. This will work hardship in many towns of small population, for the bills of some of them amount to as much as \$10,000 or 12,000. To meet one-half this amount will require a decided rise in rate of taxation, or possibly the issue of bonds.

FOREST ADMINISTRATION IN MYSORE.—We have received several lengthy communications from the Conservator of Forests, Mysore, with reference to the review on the management of the forests in that State which appeared in our issue of December last. We regret that owing to the heavy demands made upon our space we are unable to devote more of it to this matter. In his letters the Conservator repeats the remarks which appeared in full in his communication to the *Madras Mail* last year, which we have already noticed. The gist of his contentions appears to be that the writer of the review in question has quite failed to grasp the forest situation in Mysore, and that far from being in a backward state the forest management, under its present Conservator, is in a high state of efficiency. We feel confident that our readers will be extremely interested to receive this assurance coming from such a quarter. We trust that the great number of important questions demanding attention in our columns may not preclude the possibility of our devoting space to a notice of the next Forest Administration Report of this State.

TIMBER SUPPLY IN AMERICA.—At the American Forest Congress to-day (January 6th, 1905) the Railway officials mentioned that the supply of white oak and yellow pine would be soon exhausted, and suggested the cultivation of the yellow locust tree. It was stated that the railways paid \$45,000,000 annually for wooden

ties (sleepers) for which there was no substitute. Referring to deforestation, Mr. Roosevelt said that if the present rate continued a timber famine would be inevitable. Mr. Roosevelt pointed out that he had repeatedly recommended to Congress the creation of a national forest service, concentrated in the Department of Agriculture. The President stated that he was glad that Western sentiment favoured the setting aside of national forests which the administration's policy would render more actively and permanently useful. Much remained to be done, but permanence of the timber supplies was more nearly assured at present than it was previously.

THE RIFLE IN COLD CLIMATES.—Among the experiences gained by our soldiers in Tibet was that a rifle taken to a very cold climate needs special care if its efficiency is to be preserved. In this it is very human, and the importance of properly protecting the mechanism of rifles in such circumstances has led to the issue of the following Army Order :—Rangoon oil when subjected to great cold becomes thick and causes misfires by checking the action of the striker. In cold climates, therefore, Russian petroleum oil (*i.e.*, paraffin oil) will be substituted for Rangoon oil, and may be drawn in lieu of it in places where the temperature falls below 10° Fahrenheit. The removal of all oil from the firing mechanism and the substitution of paraffin sparingly applied is a precaution that should be inculcated on all troops operating in places where the temperature falls below the freezing point of oil.

SWEDISH FORESTS AND SAW MILLS IN ANCIENT TIMES.—The Norrland forests have from time immemorial been so extensive and dense that they were considered almost impenetrable, but since the country became more and more peopled they were so greatly trenced upon that the Government was soon compelled to take them under its protection.

By a bill in 1542 King Gustaf I declared that all such possessions which lay far distant from the villages should belong

to the Government and Crown of Sweden. Trespasses against this royal ukase were certainly punished during the lifetime of this vigorous king, but misuse of the forests gradually crept in, because the Crown omitted to guard its reputed estates. Owners of farms included in their estates and villages miles of distant Crown forests, the territory of which some times extended to the mountains. To check such undue interference a royal ordinance was issued by the great economist Carl XI on 13th December 1683 to governors, etc., to protect the forests. Further forest orders were issued in 1730, 1734 and 1741. That the foregoing were not sufficient protection for the forests appears evident from the complaint of the mineral surveyor in Vesternorrland thirty years later.

CAMPHOR IN CEYLON.—At a recent meeting of the Ceylon Agricultural Board H. E. the Governor read interesting extracts from a letter which he had received from Sir Thistleton Dyer, Director of the Royal Botanic Gardens, Kew, London. Sir Thistleton wrote: "I have long urged the cultivation of camphor. I believe it is much in demand in the manufacture of celluloid, and the Japanese virtually have a monopoly of it in Formosa. Apart from this the wood ought to have a commercial value." Sir John Keane, who has visited Formosa, told a representative of the *Times of Ceylon* that camphor wood was very hard and durable, and the river boats in Formosa used to be entirely composed of it. But now it was required more especially for the manufacture of camphor. The Japanese, said Sir John, cut down the camphor trees entirely—they grow in virgin forests—and prepared the camphor from the hard wood in the centre of the trunk, which naturally yielded a larger supply than the trimmings do as in Ceylon. Sir John said he understood that in Ceylon only the branches were lopped off and used.

THE NEW FOREST OF DEAN SCHOOL OF FORESTRY.—Mr. Stafford Howard, Commissioner of Woods and Forests, is considering the advisability of admitting a limited number of working woodmen from 21 to 25 years old into the new School of Forestry, Forest of Dean.

RUBBER AND FIBRE CULTIVATION IN MADRAS.—Important experiments are being made in the production of rubber and fibres at the Government plantations at Benhope, Burliyar and Katlar in the Madras Presidency, where their cultivation has attracted much attention from planters and others in Southern India who have taken up the exploitation of these products in addition to tea, coffee and cinchona.

APICULTURE IN THE KHASI HILLS.—The Assam Agricultural Department are taking steps for the improvement of apiculture in the Khasi Hills, one of the few places in India where it is said to be systematically practised. The method of rearing in those hills is crude, and said to be not unlike the old system of rearing bees in skeps practised at Home. It is intended to bring the bar-frame hive to the notice of the Khasi rearers after careful trial at the Government Experimental Farm at Shillong. Apiculture, as an important industry, is practically non-existent in India, but that money can be made out of it is testified in a recent official report on the production of bees-wax in the country.





Marsh Hall, the Main Building of the Yale Forest School in New Haven, Conn.

INDIAN FORESTER

MAY, 1905.

FOREST ADMINISTRATION AND REVENUE MAKING.

A decade ago an important pronouncement on Forest policy was issued by the Government of India.* The Resolution contained a masterly summary of the case for the forests as it stood at the time ; existing defects in the administration were pointed out especial attention being drawn to the directions where the management pressed too hardly upon the ryot ; the Paper then proceeded to lay down the lines which it was desired should guide their future policy. We may shortly summarise these latter. They have been often quoted and were dealt with in leaders published in the *Pioneer*† two years ago. The principle was enunciated that considerations of revenue from district and village forests should ordinarily be subordinated to the satisfaction of local requirements and to the contentment of the peasantry. This principle was chiefly to apply to village and district forests, from which local needs are chiefly drawn. The Resolution classed the great timber-producing reserves as "forests which afford a supply of valuable timber for commercial purposes," and stated that these were to be managed mainly on *commercial* lines as valuable properties of, and sources of revenue to, the State. We have italicised the word 'commercial' for reasons which will be apparent later.

In a February issue of the *Englishman*‡ a leader appeared in which, under the significant title of 'Revenue hunting in Forest Administration,' the writer endeavoured to show that certain of the principles laid down in the Resolution are not only not being carried out by Local Governments in the manner intended by the Government of India but that the intentions of this latter are

* Resolution No. 22 F. of October 19th, 1894.

† The 'Pioneer,' February 25th and 27th, 1903.

‡ The Calcutta 'Englishman,' February 13th. 1905.

apparently misunderstood. The writer, who displays a considerable knowledge of the subject on which he descants, acknowledges that full credit should be given to Local Governments for having carried out to the full the Government of India's wishes as regards supplying the ryots with their requirements in the way of free produce and grazing. It would have been difficult to do otherwise when we read in the last Annual Report of Forest Administration in British India* that produce to the value of Rs.33,21,957 (or one-sixth of the gross revenue collected in the State forests) was given free to those resident in the neighbourhood of the forests, and that the value of free grazing equals the amount of revenue collected under that head. The leader-writer however, continuing, pertinently asks "Why was it not then declared that if the subordination of revenue making to the satisfaction of local requirements held good for the minor forests and reserves nearest to the villages, many of which forests will eventually disappear, revenue considerations must for at least equally strong reasons be assigned a secondary place in the management of those great permanent State forests with which the villager is less concerned? The correct answer is that, however much the proposition may be contested in theory, the Forest Department was then and is still regarded as primarily an agency for the collection of revenue."

In support of his contentions the writer instances the various forest reports of Local Administrations and the Government criticisms upon them, noticing the marked prominence given in these latter to the financial balance sheets; he points out that in the more backward localities, where few or no regular working plans exist, the chief question appears to be 'revenue hunting,' and in a subsequent paragraph writes 'In a province which prides itself on a settled forest administration and whose collection of standing forest orders is at least weighty in avoirdupois, the native forest officials are formally discouraged from entering their forests, unless for every journey or day's work noted in their diaries they can show that they have made revenue. Consequently many of these reserved forests have been so assiduously hunted over for anything which shall sell

* Vide p. 41 of this volume.

for revenue that all mature and half-mature saleable trees have been cut out, while the legitimate revenues of future years have been anticipated for several decades to come. Yet the local authorities, from motives of economy (save the mark!) and in view of the small total provincial revenue realised, hesitate to spend the few thousand rupees which would enable them to procure an adequate supply of trained native officials from Dehra Dun and to permanently organise the forest operations.'

The writer holds that in some parts of the country the responsible authorities fail altogether to realise that Government in respect of its reserved forest property especially is in the position of a trustee whose bounden duty is not merely to conserve but also to improve the estates confided to it as the guardian of public interests in the days to come. He states that case after case might be mentioned where this principle is being defied in the hunt for revenue. He insists that the sole justification for 'reserving' a State forest in India (*i. e.*, for declaring it public property and placing it under a severe penal law) is that the forest is required permanently for the welfare of the country generally, and that this carries with it an absolute obligation to maintain and to enrich it, if it needs enriching, as it almost invariably does. This obligation, he states, is being often overlooked or purposely evaded. The writer certainly has the argument on his side when he alludes to the training of the subordinate staff. A forest is a bank, and it is needless to say that the higher the efficiency of the staff the richer will that bank become.

Continuing, the article maintains that charges for the improvement of the growth and the future timber are usually promptly negatived either because no immediate profit will ensue or because a certain fixed quota of provincial nett revenue must be forthcoming. The 'point is,' he says, 'that future interests are sacrificed to present needs. This is mere lumberer's work, not State forest economy.'

Whilst we are of opinion that the writer has perhaps not stated his case with that impartiality which such a subject requires, his article undoubtedly provides food for serious reflection. The

question is not here alluded to for the first time, and few, and least of all the layman himself, could peruse the provincial reports of the last decade and the Local Government Resolutions thereon and fail to perceive that the question, one might term it the principle, of revenue making does unduly influence that of the management of the great timber reserves of the country, as far as the Local Governments themselves are concerned.

The writer of the article under consideration has pointed out, the reasons which led to the reservation of these reserves, but asks whether the spirit in which they are being managed is in concurrence with that of the Government of India Resolution of 1894. On the other side we have the question often put why, with a Forest Department in the country, is it not always possible to meet local provincial requirements of timber? The answer is comparatively simple, and yet it is possible that it has not been realised as widely as should be the case.

It will be admitted that in all commercial requirements it is to the open market that one must turn to ascertain the true price of a commodity. In India we see the Railway Engineer, Roads and Buildings, Mines, City Corporations, etc., going to this market, and the timber they obtain there is not invariably India-grown or even if so it may not come from the Government Reserves. What are the reasons for this apparently anomalous state of affairs?

1. There still exist in the world great virgin forests under no sort of State control where the lumberer holds sway. The timber extracted from these pays no royalty or, if any, a negligible amount, and thus the wood can be put on the market at a rate which will cover cost of extraction and lumberer's profits. It will be easily understood that such timber can easily compete with the local product of even distant countries where the proprietor naturally wishes to obtain the value of his wood, irrespective of the cost of extraction, carriage, and perhaps middlemen's profits.

2. The accessible forests in India had been practically ruined by a long course of neglect when the Forest Department was formed, and true forest conservancy, which aims at bringing on to the ground a normal crop of trees, entails the closing of such

forests to heavy cutting. In other words, selection fellings are necessary, and this means the removal of trees here and there over the area with a consequent small profit on the transaction and an increased price on the wood extracted.

3. Forests which still contain large timber in considerable quantities are at present so inaccessible through the absence of good provincial intercommunications that they are practically unexploitable.

The large virgin forests alluded to under 1 are rapidly being cut out, and it is becoming more evident each day that another decade or so will see supplies from this source at an end. States will then have to rely on their own forests to supply them with the timber which is so indispensable to their requirements, and the price of that timber in the open market will have then reached its real value, not the fictitious one which at present rules owing to the operations of the world's lumberers. It may by then be hoped that our provincial intercommunications will have considerably improved. Thus India will then have to depend upon—

(a) Its at present inaccessible forests (by then accessible?)

(b) The timber reserves which the Department are now striving to bring back to their formerly undoubtedly fine condition.

It is with these latter that the criticiser of Local Government policy concerns himself, and we fear that we cannot altogether disassociate ourselves from the epithet of 'lumberer' in respect of these forests. The term is to some extent, probably though a misapprehension of the true position of the case, justifiable, for in some parts of India the idea of forest management is that the lumbering or commercial aspect of the work is the one which should be primarily held in view by the Forest officer. We have seen quite recently a Local Government deliberately drawing the attention of its Forest officers to the fact that they are firstly and pre-eminently timber merchants? Surely the very first principle of true forest conservancy, the first consideration of all countries who have forest estates, is their duty to posterity, and in the interests of that posterity their authority is exerted towards restraining the zeal of the 'timber merchant' Forest officer. We all know how easy it is to mark over an

area for felling if the order is that revenue is to be the first consideration. The lumberer requires no special course of scientific training. The anxiety and mental strain commence when tree-marking for removal on true scientific principles has to be carried out, and to fit him for this duty the Forest officer goes through the most expensive course of tuition obtainable in England at the present day. Further, what does lumbering in a State forest mean? The wood taken from it must be placed on the open market, and under present conditions has there to compete with the product which has paid no royalty on the timber. The consequence is that the wood from the State forest which, if held over for a few years would fetch its real value, is now sold at a price far below it and for one at which it could never be grown. The forests of India are a great inherited property, but although the inheritor has not had to put out the money which produced them, that monetary value is there and is being thrown away by lumbering and enforced sales.

We have noticed this question at some length because, whether the case for revenue hunting in forest administration has been overstated or otherwise, a feeling undoubtedly exists that in parts of India the 1894 Circular has been misunderstood in an important particular and where such a misunderstanding may result in serious harm to, or at any rate in greatly delaying the restoration of, the normal crop in the great timber reserves of the country. Should this really be the case we would suggest for consideration the advisability of a clear definition of the term 'commercial' as used in the sentence of the Government of India Resolution to which we have referred. We may say that we feel confident that Local Governments have equally as strongly as the Government of India the true interests of their great and valuable forest estates at heart and that their desire is to bequeath them to their successors, not only in their present state of efficiency, but greatly improved as a result of their own administration.

SCIENTIFIC PAPERS.

A FURTHER NOTE ON THE PRESERVATION OF BAMBOOS FROM THE ATTACKS OF THE BAMBOO BEETLES OR SHOT-BORERS.

In the Appendix Series of the *Indian Forester* [xxix—12, (1903)]* some notes were given upon the life-history of one of the minute bamboo beetles, or 'shot-borers' as they have been popularly called, and the question of the preservation of the bamboo from their attacks was discussed. The effects of the latter are well known. The insects tunnel into the stem and reduce its wood-structure to powder. It is some years now since Mons. P. Lesne of the Paris Museum, at the request of the authorities of the Indian Museum in Calcutta, examined sets of specimens of these beetles sent home to him. Mons. Lesne reported that the smaller of the two beetles received was a widespread insect known as *Dinoderus minutus*, the second of the two a species unknown to Science, which he named *D. pilifrons*. Up to the year 1903 it was generally supposed that these two beetles worked in company, and that they were to be found distributed throughout India.†

Although the researches which are being instituted into the life-histories, habits and distribution of the two species are by no means complete, it has been shown in the note to which allusion has been made above that the beetle almost invariably) if not invariably, responsible for the riddling of bamboos in Calcutta (and possibly to the south throughout the Madras Presidency) is *D. minutus*, whilst its confrère *D. pilifrons* would appear to confine itself to Upper India. ‡

A series of experiments and observations were conducted at the Indian Museum throughout the greater part of the year 1903

*A note on the preservation of bamboos from the attacks of the bamboo beetle or 'shot-borer.'

†Indian Museum Notes. I, 43; III, 123; IV, 135; V, 166. Inj. Ins. Ind. For. p. 42.

‡ Vide Depart. Not. Ins. wh. aff. For. No. 2, 168

(as fully detailed in the note in the Appendix Series) with a view to ascertaining whether it was possible by impregnating or soaking the bamboo with some preservative material to protect it from the shot-borer's attacks. It may be mentioned that incidentally, in the course of these experiments, a large amount of information was obtained on the life-history of *D. minutus* and of the reasons which lead to its being such a pest within the area of its depredations.

The bamboos experimented with were some from a lot received at the Government Telegraph Workshops in Calcutta from Northern India. They had been cut in the cold weather of 1902-03. As already explained in the previous note, these bamboos were to be converted into field telegraph posts, and in the hope of giving them some protection against the shot-borer pest they were subjected to a series of soakings in water, copper sulphate and Rangoon oil. For over eight months untreated bamboos and those treated with one or more of the above solutions were kept under close observation, all the lengths experimented with having been received direct from the Workshops, chosen at haphazard by the Superintendent. As a result of the carefully recorded observations throughout this period it was proved that the untreated bamboos were invariably attacked by the shot-borer, *D. minutus*, within a couple of months, *i. e.*, between March and May; that soakings in water alone or water followed by immersion in the copper sulphate solution were equally innoxious to the beetles; but that those bamboos which had proceeded the stage further and had been soaked in the Rangoon oil were immune from subsequent attack by the pest. It was shown that the insect passes through no less than five generations in the year, different swarms of adult individuals appearing in April, June, July, September and October, and that the attacks of one or more of these generations with those of their resultant grubs would ordinarily have reduced the bamboos, if untreated, to powder; it was therefore held to have been proved as a result of the experiments that the life of the bamboo had been lengthened by at least a year as a direct result of the impregnation.

It has since been possible to trace the history of these treated bamboos, all of which were converted into field telegraph posts, a stage further in their career, and the evidence that has been obtained both by the use of the posts in the field and, equally important, by their storage in an open shed without any special protection being afforded to them in the Workshop yard points to the wonderful efficacy of the oil treatment. It is the purpose of this supplementary note to give publicity to this fact, firstly, owing to numerous enquiries as to the necessary treatment to be given to the bamboos, having been received from the Public Works Department, and, secondly, because the oil treatment for the preservation of bamboos may be said to have now passed the rubicon of the 'Experimental Stage' and to have reached the arena of practical utility.

To go back to the bamboos converted in 1903. Some of them were sent up that year for service with the Tibet Mission. They were returned to store in Calcutta about the beginning of the present year, and Mr. L. Truniger, C. I. E., who was in charge of the Field Telegraph with the Mission, has stated that they had fully answered expectations. Some of these returned posts were inspected by the writer in the yard at Calcutta towards the end of March last. Although it was two and a half years since they were cut in the forests of Upper India and close upon two years since they were treated with the oil, they showed no trace of attacks by the *Dhoderus* beetle. It may be contended, and justly, that throughout 1904 these posts had been at an altitude greatly above that at which either of the shot-borer beetles could, or do, live, and that they were thus safe from their attacks. This was so, but the same argument does not hold good when we come to consider those converted bamboos which remained throughout the year in store in Calcutta. An inspection of these has shown that they have remained equally immune from the pest. Most are aware how short is the life, economically, of the bamboo after it has been cut, and many know the difficulties which stand in the path of the lance, the tent-pegging and hog-spear purveyor. The results that have attended the treatment of the 9,000 bamboos in 1903 are well worthy

of the consideration of these latter, for on present observations it has been shown that the impregnation with the oil leaves the bamboo strong and serviceable two and a half years after it has been cut. Arrangements have been made to keep some of these posts under continuous observation with the object of ascertaining the longevity to which the treatment enables them to attain. That the Telegraph Department has the fullest confidence in a discovery the full credit of which chiefly belongs to it, is borne out by the fact that an additional 30,000 bamboos are at the time of writing being put through the treatment and converted into field telegraph posts. It may be stated that the recommendations of the previous note are being followed, the bamboos being first soaked in water for five days (this is very necessary for reasons previously given), allowed to dry for several days, and then re-soaked in the Rangoon oil (crude petroleum), this latter, as used in the Workshops, having the consistency of treacle.

That the use of the bamboo as a field telegraph and telephone post has a great future before it has been proved by the Japanese in the present campaign. The following note upon the subject appeared recently in the *Pioneer** : " Every general of brigade in the field is 'at the end of a wire' which his divisional commander controls and the generals of divisions are in touch by telegraph or telephone with the corps commander. The engineers run wires after the columns with marvellous rapidity. Firing is heard somewhere at the front. A detachment of engineers emerges from headquarters, pack ponies carrying bundles of light bamboo poles, while coolies and carts follow them with coils of slender copper wire. The poles, which have pointed ends, are quickly planted, the wire spreads out as fast as men can uncoil it, and a field telephone is at work." As having a bearing upon the experiments and results attained in India, Mr. Y. Hara, Chief of the Japanese Forest Bureau, was addressed with the object of ascertaining whether the bamboo field posts used by his countrymen were subjected to any treatment. His reply would seem to show that in this matter Japan is in the position occupied by India before the discovery of the

* Allahabad, *Pioneer*, October 24th, 1904.

oil treatment. He wrote: "In answer to your enquiries with regard to a protection of our bamboos, I would state that although the method in preserving bamboos in the field is not well known, there are three processes of treatment generally adopted by our people—

- (1) The season of cutting—September and October.
- (2) The fumigation in sulphur.
- (3) Application of both of these processes."

E. P. STEBBING.

ORIGINAL ARTICLES.

FORESTRY EDUCATION IN THE UNITED STATES.

BY G. HEWITT MYERS, M. F.

EXPERT, U. S. BUREAU OF FORESTRY.

During a recent tour of India, I have been particularly impressed by the similarity of many of its forest problems to those of the United States. It is clear to any forester visiting the two countries that in spite of the difference in the species of trees composing the forests the methods of silviculture used in India are directly applicable to many sections of the United States. The handling of the spruce and deodar of the hills is far more instructive to the American forester who is interested in the coniferous forests of the North-Eastern States and the Western mountains than the forests of the Alps. In the same way no European forest would help the American in handling the long-leaf pine of Georgia as much as the long-leaf areas of Northern India.

It is of greater value to us to study how others have worked under conditions similar to ours at the present day than to study forests which have been under management for a century. The same is true of the work of organisation, preparation of working plans, methods of inspection and control, and fire protection. What I have said of the similarity between the problems in India and America is likewise true of forest education. The question of training officers of the superior service is specially prominent in

India at this time, on account of the abandonment of the Cooper's Hill College and the establishment of a Department of Forestry at Oxford. What is being done in America in technical education may therefore be of interest to the readers of the *Indian Forester*.

A great deal has been written in the newspapers of different countries about the enormous saw mills of America, the large scale on which lumbering operations are conducted, the immense waste through fire, the loss by timber-stealing, the injury to the forests by grazing, and so forth. An impression has thus been created that the forest conditions of the United States are as bad as any in the world. Until very recently, this charge was justified, and as yet we have made only a small beginning. But during the last ten years, the United States has made a greater advance in forestry than any other nation in double that length of time. Ten years ago, the Federal Government had a small division of forestry under the Department of Agriculture, for which an annual appropriation of some 25,000 dollars was made. This division was engaged altogether in the work of research and a propagandism. There were no Federal reserves, although several national parks had been established to preserve natural scenery in the mountains of the west. At that time there were only half a dozen trained foresters in the country; no forest schools, practically no forest literature, and relatively little public interest in the subject.

To-day the Federal reserves in addition to the national parks amount to over sixty million acres, and many million acres are under consideration for reserves. The Federal Government is now spending annually about three-quarters of a million dollars for administration, protection of reserves, and in research work.* The States individually have also begun to establish reserves, among

* Unfortunately, the forest work of the Federal Government at present is divided among three different departments, and the administration of all the public lands has always been under the general land office of the Department of the Interior. The forest reserves are therefore administered by that Department. The Geological Survey, also in the Department of the Interior, has had charge of the survey, mapping, and demarcation of the reserves, and in connection with this work has carried on reconnaissance examinations of the forest. The work of research, the study of growth, the effects of fire, and grazing, and similar scientific work, fall naturally to the scientific department of the Government, namely, the Department of Agriculture. Under this Department



Stone Cottage; one of the Buildings of the Forest School in Milford, Penn.



which is New York with 1 $\frac{1}{4}$ million acres, Pennsylvania with several hundred thousand acres, and other States, notably Michigan, Minnesota, Connecticut, and Massachusetts, each with a nucleus for State reserves. These State reserves show the serious interest now taken in forestry in various parts of the country as these reserves have been established under the necessity of buying the lands from private owners. There is likewise a good prospect for a large Federal reserve in the Southern Appalachian Mountains which will have to be purchased at an expense of about ten million dollars. About twelve States now employ the State Forest Officers to administer the State lands and to create public sentiment. State work has been considerably retarded by the disinclination of the State Governments to adequately pay their Forest Officers and to appoint men of proper training.

There is a National Forest Association which has a rapidly increasing membership, now numbering some three thousand members, including foresters, lumbermen, owners of large estates, and game-preserves, etc. In fact, the membership includes men and women of all sorts and conditions in all parts of the country who are interested in bringing before the people the great advantages which will accrue to our national welfare, if we accept the opportunity afforded by the newness of the country, to take hold of sound principles of forestry at an early period in our history. A National Congress is held annually under the auspices of the National Forestry Association at which papers are read, current questions discussed in a more or less popular way, and resolutions passed upon points that affect the proper use of forests. At this winter meeting there are invited to be present men interested in various occupations affected by forests, such as lumbering, grazing,

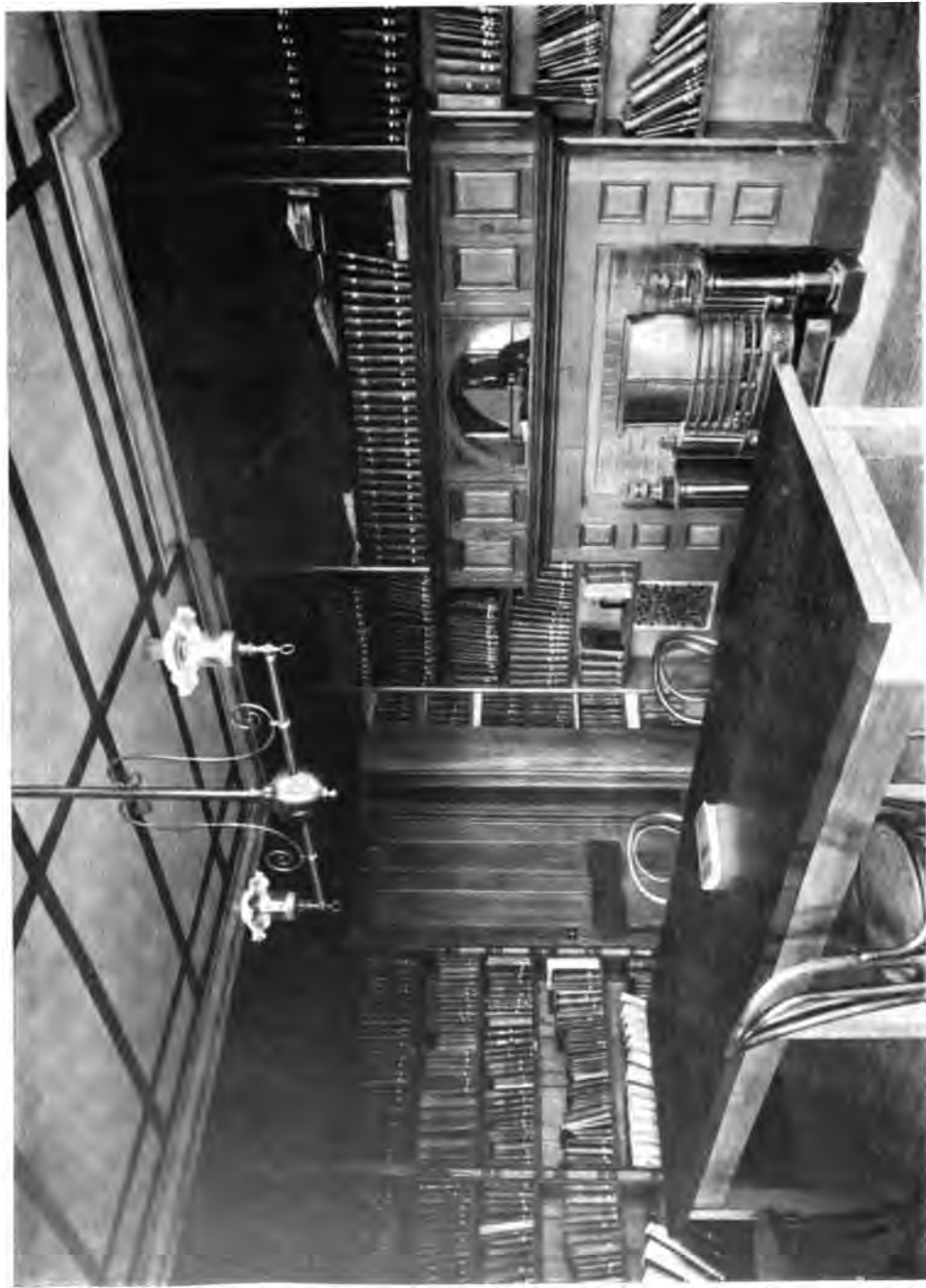
is the Bureau of Forestry, which is now engaged chiefly in work of research, in advising the land office in technical forest matters, in assisting private owners by personal advice, in co-operating with the several States in developing their forest policies, and so forth. This dividing up of the Federal forest work has led to great confusion and waste of energy. A strong effort is being made to consolidate under the Department of Agriculture all Federal forest work. As soon as this is accomplished the administrative service may be rapidly developed by Mr. Pinchot, Chief of the Bureau of Forestry, who has under him a strong staff of trained foresters.

irrigation, wood-pulp manufacture, mining, and so forth. Besides the regular business of the Association, one day is given up to the discussion of questions affecting each of these industries. A summer meeting is also held which is confined to forestry alone. It is expected that these conferences will be of great value in diffusing a correct knowledge of what forestry aims to accomplish and in showing the foresters themselves what opposition they will have to face. There is a Society of American Foresters whose membership is limited to those who have accomplished some work of importance to forestry. This Club's headquarters are in Washington, where bi-weekly meetings are held for the discussion of technical matters. An election to membership in this Society is a distinction, although little is known of it outside of the profession. There are also numerous State Forestry Associations whose objects are the same as those of the National Forestry Association.

The National Association has an official organ known as *Forestry and Irrigation* (formerly *The Forester*). This periodical is published quarterly at Washington and contains some articles of a technical nature, but for the most part its character is that of a popular magazine.

As in the early stages the development of forestry is still governed by the supply of trained men, officers in the Indian service will readily see how quickly, in a country like the United States, a small number of trained men is swallowed up and lost in the vast amount of work to be done and the rapid development of new branches of work. Step by step with this development and broadening of scope, a distinctly *American* profession of forestry has appeared, and it has become evident that men who have had only European training are not competent to fill the positions now opening in the United States. At the present time such men cannot pass the Civil Service Examinations for eligibility to the Bureau of Forestry without the addition of a field training in the United States. This is a very recent condition of affairs due to the rapid raising of the standard for these eligible lists, which in turn is due to the establishment of American technical forest schools.





A Corner of the Library of the Forest School.

Up to 1898 it is safe to say that the prospective forest student would have been advised on all sides to go to Europe, probably to Germany, and, what is more, to stay there from one to two years according to previous knowledge of the language, then to return to the United States and begin practical work in the Government service. At present sounder advice would be that he should first study at an American school and then go to Europe for a stay of two to five months according to the time at his disposal. As for the best country for an American to visit, this depends primarily on whether the student knows French or German. Beyond this the relative value of French and German is a point open to discussion, into which I will not enter. The point I wish to make is that in the course of the past five years the standard of forestry education has so changed in the United States that now the home school training is the essential thing and the European trip is at most only supplementary, and it seems probable that the near future will see a still further change in the same direction. Formerly, the European training was supplemented by various sorts of instruction and practise at home, and it was not until 1898 that the opening of a Forestry Department at the University of the State of New York ("Cornell") and of the Yale Forest School two years later made it possible for the prospective forester to begin his professional training at home. That home schools of forestry were demanded is sufficiently shown by the increase in the enrolment at the Yale School from seven in 1900 to sixty or more during the current year. That a home training is the best for practical work seems evident if one considers how peculiarly its own are the forest problems of any country, when viewed in the broadest sense. Of course, there are certain sciences whose principles are universally applicable, such as structural botany and morphology, mathematics, entomology and geology, and to a certain extent the art of silviculture as well, but all these form only a fraction of what every practising forester must know. On the other hand, how can any man (and much less a boy fresh from school or college) learn in Germany the problems of transport which he must face in the United States, or learn to estimate or

"cruise" standing timber or learn to cope with the complexities of land tenure and labour problems in British India? Needless to say a foreign country is not the place to learn forest botany or the peculiarities of the people with whom he is to deal. This last point is one of vast importance in the United States; the forester must not only learn to deal with the kinds of men who will be his future superiors and subordinates, but he must also have a clear comprehension of the view-point of lumbermen, farmers, cattlemen and sheep-men, railroad managers and wealthy landowners. Most of all, why should a man who is to practise extensive, or perhaps even rudimentary, forestry learn his profession in a country where a thick population, a large peasant class, a paternal form of Government, and a long settled forest administration give the key to the instruction which he will receive and the principles which will underlie his forestry sense? How is one to learn constructive forestry in a country where forestry work is administrative routine? To be sure, much of the forestry work in the United States will eventually be administrative in the service of the Federal Government, in that of the individual States, or large corporate or private holdings. Now, however, the bulk of work lies in developing and encouraging public sentiment in favour of forestry, and in research work which shall furnish necessary data for proper administration when the country is ready for it. The extent and diversity of the necessary research work can be appreciated only by those who have a clear idea of what there is to be learnt in a large and rapidly advancing country whose forest products stand fourth in value in her entire commerce.

Instruction in forestry likewise forms a continually broadening field of work, but this instruction must differ as widely from that of the best of European schools as does the practice in a country where systematic working plans are only beginning to be known. Three kinds of schools are needed to give three separate kinds of training. First, there must be a national (not necessarily a Government) school which shall serve primarily as a feeder for the Federal service. This service in the opinion of its head, Mr. Pinchot, will, in the future, as it has in the past, make greater and greater demands for



Some of the Buildings of the Yale Forest School at Milford, Penn.



first class men. It must have men who are able and willing to do work with their hands and legs as well as with their heads. This does not mean simply that they must have a reasonable amount of nerve and endurance but also the willingness and ability to fell their own trees for stem-analysis or to cook their own food and tend their own horses, if need be. They must be men of sufficiently broad education to take up work in new branches and in new regions, to weigh future advantages and disadvantages, and to adapt themselves to conditions as they find them, unbound by any habit of stereotyped procedure, men who can use their own ingenuity to solve questions for which there is no precedent to aid them.

Second, there must soon be local schools in the different parts of the country where the forestry of the locality, as it develops, may be taught to men who cannot enter the national school.

NOTE.—Such schools have already begun to appear in more or less rudimentary forms, at the Universities of Maine, California, Nebraska, and elsewhere

Third, there will soon be a need for a school for Forest Rangers; such a school may in many ways be compared to the one at Dehra Dun for the men of the Indian Provincial Service. It will readily be seen that of these three, what I have called a National School is the one first needed. Before speaking of the probable future development of such a school, it may be well briefly to review those which we have. I shall only mention one of the many institutions where the best of instruction may be had in the underlying sciences. At the Arnold Arboretum, a part of Harvard University, are two men whose names are well known in American forestry, Professors C. S. Sargent and J. G. Jack, and who have given their first instruction to some of the best known foresters of America.

NOTE.—In the fall of 1903 forest instruction was begun in the Under-graduate Department of Harvard University under Mr. R. T. Fisher, a graduate of the Yale School.

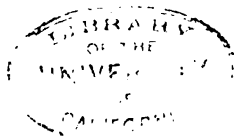
The Cornell School of Forestry was established as a part of the Under-graduate Department of the University of New York

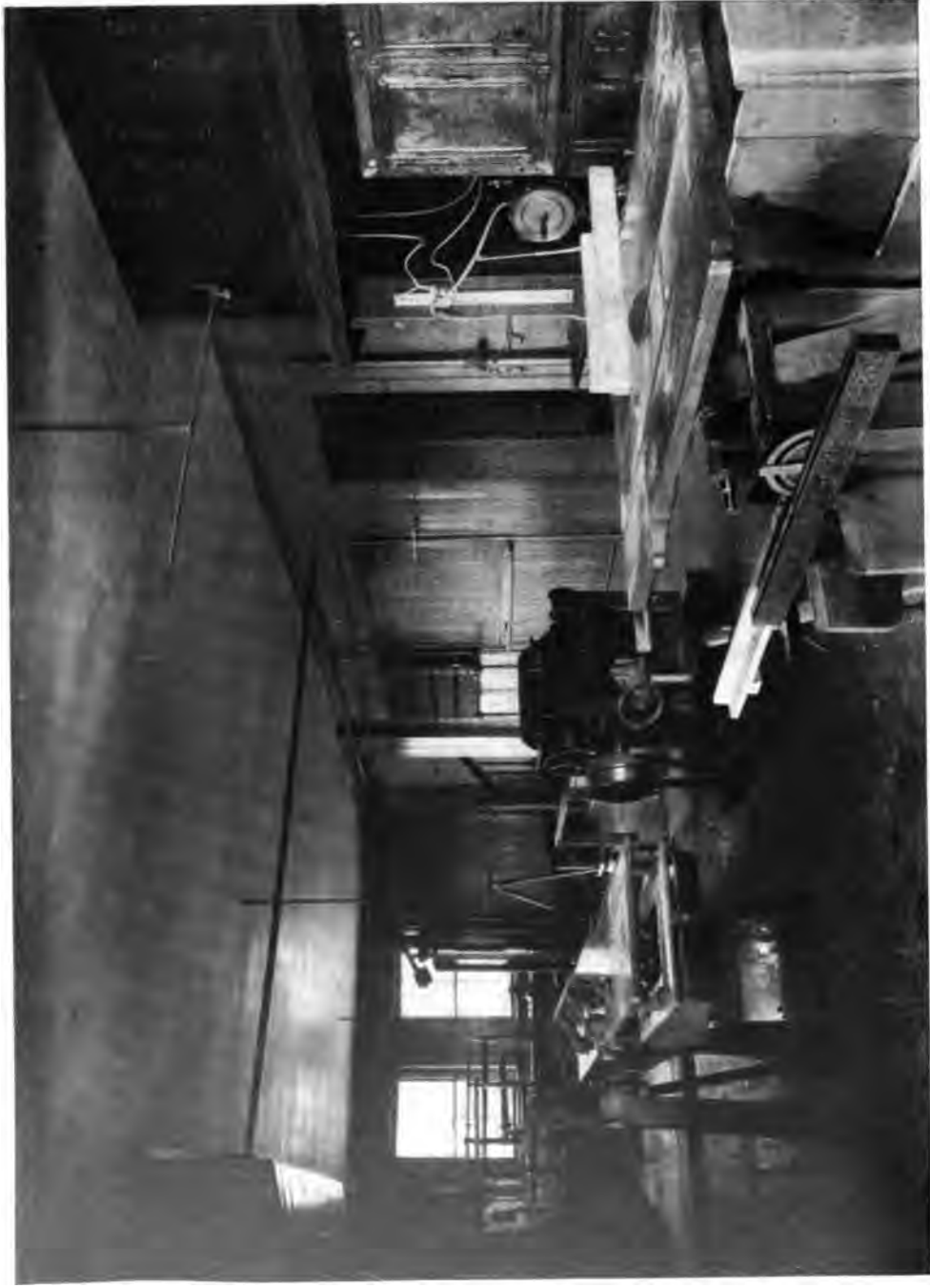
at Ithaca in 1898. This school had two excellent instructors in Dr. B. E. Fernow and Mr. Filibert Roth, and gave a most useful training leading to a Bachelor's Degree in Forestry. Unfortunately, the school was dependent upon an annual appropriation from the New York State Legislature and was suspended in 1903, Dr. Fernow, its former Director, is now editing the *Forest Quarterly*, a periodical of scientific forestry, with a staff of associate editors, which includes most of the prominent foresters of the country.

Private instruction in forestry has been given since about 1897 by Dr. C. A. Schenck at Biltmore, North Carolina, on the estate of Mr. George W. Vanderbilt. The course occupies one year, including a short European tour, and, on its completion, a certificate is given. Its usefulness is vouched for by an increasing number of students.

At the present time, the Yale School of Forestry is easily the foremost in the United States. It gives the most thorough technical training requiring a Bachelor's Degree as a qualification for entrance ; it is the only one on a permanent endowed basis, and is by far the largest in the country. Professor Graves, the Director, is probably the best forester in the United States, and his work in organising the school is the best thing that has been done for American forestry during the past four years. Through the generosity of Mr. Gifford Pinchot and his family, the school was opened in September 1900, as a Graduate Department of the Yale University, and began the year with Professor Graves and Assistant Professor Toumey as instructors in technical subjects, with the regular University facilities as auxiliaries, including such well-known scientists as Professor William J. Brewer. The students numbered seven during the first year, and the writer counts it a great honour to have been one of them. For this reason some allowance may be made by the reader for the following account of what the school has accomplished and hopes to do in the future.

At present there are 30 odd students in each of the two classes. During the four years of the school's existence, the faculty has had to face the above formidable increase in enrolment and a fire which necessitated the re-modelling of the building set apart by the





Wood-Testing Laboratory of the Forest School.

University for the school's use. In spite of these things, however, the course has continually improved. There are two distinct bases for instruction—one in New Haven, where the University is located, and where the principal part of the laboratory and classroom work is conducted; the other at Milford, Pennsylvania, in a region well known for its white pine and hardwood timber. Here a considerable part of the forest work is carried on: each plant is provided with lecture halls, library, reading-rooms, laboratories and so forth. The accompanying photographs will give an idea of the buildings and some of the rooms. As this is essentially a professional training school, no student is admitted unless he has already received at some high grade collegiate institution a liberal education, including the study of mathematics, language, and natural science. The courses at Yale are, therefore, of a technical character. The graduates are often called upon to undertake work of great responsibility immediately upon leaving the school. For example, several have received offers to teach in colleges giving courses in forestry. One has been sent to the Hawaiian Islands to take entire charge of the insular forests; others have taken responsible commissions in charge of private estates. In nearly every case the graduates have at once taken up work which they could not have done without a thorough general education. The entering class meets at Milford in July, and spends ten weeks in camp doing forest work with Professor Graves. Each morning the students meet for one or two hours of lectures, and the rest of the day is then spent in the forest. The students learn first to identify the trees empirically, the theoretical work of forest botany being taught later at New Haven. Thus consistently with the whole course of instruction, the student is taught to know something of the trees as they grow in the forest before he is asked to study their botanical and silvicultural character from text-books. The remainder of the summer term is occupied mainly in the study of silviculture and forest mensuration. These subjects are likewise taught less from text-books than in the forest itself. One of the first tasks of the student is to learn to fell a tree properly and to cut it into logs, so as to yield

the greatest measure of boards or other products. Each student is required to make stem-analyses of seventy-five to one hundred trees, and to determine their contents ; to construct tables of value, and form-factors ; to make a study of the rate of growth of a given species in diameter, height, and volume and to construct yield-tables. He is not merely told how to estimate timber and study growth, but is required to do the work for himself. In botany, the student must be able to identify trees in the forest both in winter and in summer ; in geology, he must identify rocks in the field and make soil maps. In engineering he learns to make topographic maps with the transit and other instruments, and also does quick map work, such as is done by Army Engineers. He must be able to lay out roads and trails ; his knowledge of lumbering is based on three weeks spent in a lumber camp in December of the senior year, and he is then required to make a complete report upon the methods in use in the region in which he has chosen to spend his time. In addition to this, most of the students spend the summer vacation at the end of the junior year in field work for the Government. During the course, complete working plans are made by small groups of students and hundreds of trees are planted by each of them. Practise in thinnings, reproduction cuttings and other silvicultural operations are made upon the lands of several city water companies who have placed their forests under the management of the school. Space does not permit a further description of the actual curriculum, but enough has been said to show that the underlying principle of instruction is in direct contrast to the method of long text-book work in theories and principles at the beginning of the course. Theory and principle must indeed be learnt, but it is believed at Yale that if they are taught first they cannot be sufficiently closely connected with actual forest work to make them of use to the student. Future changes in the course will probably be consistently in the direction of confining the work of the two years' course still more strictly to technical forestry. Less and less of the time will be taken up with teaching such subjects as microscopic botany, entomology, zoology, geology, and so forth, as it becomes possible to demand in entrance



Part of the Summer Camp of the Yale Forest School, Milford, Penn.



requirements more and more of these subjects which can be obtained in collegiate courses. At the beginning of the school, such severe demands could not be made in requirements for admission, but the policy of the school is to take only those men who have already had the greatest possible amount of fundamental work, so that their entire two years at Yale may be free for practice in such work as they will afterwards be called upon to do.

THE HALIYAL TIMBER DEPOT.

BY W. A. TALBOT, I.F.S.

Bombay Forest Officers, retired and in active service, as well as many readers of the *Indian Forester* will be interested to learn that the well-known Haliyal Timber Depôt in North Kanara has been abolished. The last sale of teak and jungle wood was held there a few weeks ago. The whole of the stock of timber was disposed of to the usual purchasers at excellent rates. Nearly three lakhs of rupees were realized. In future the annual auction sale of teak exploited from the fine high timber organized forests of Supa in North Kanara will be held at Tawargatti on the Southern Mahratta Railway line between Dharwar and Belgaum, where a new depôt with buildings has been formed. The advantages of this location are a considerably reduced lead from the forest blocks to be worked during the next 16 years, and the Railway sidings being in the depôt itself, logs can be loaded in consequence directly on the wagons. It will be remembered that Haliyal was seven miles distant from Alnawar, the nearest station on the Southern Mahratta Railway, and the timber had to be carted that distance and again reloaded on the trucks. Haliyal has, however, the distinct advantage of being the centre of a well-established timber trade and has facilities for purchasers which the new location does not possess.

The Haliyal timber depôt was established in 1865 by Colonel W. Peyton (then Captain Peyton), a famous sportsman and excellent forester, Conservator of the Southern Circle, Bombay Presidency, for the storage and sale of teak and other kinds of

timber, cut in the Supa division of North Kanara. Each year one to two lakhs of rupees worth of wood were disposed of, principally to traders from Belgaum, Hubli and Dharwar. This material was afterwards retailed to people usually resident in the Southern Mahratta country. But as the fame of the excellent quality of the Kanara teak and the fine condition of the logs was widespread the wood has frequently been exported to many places far outside the southern parts of India. The logs are squared with the axe in the forests and are dragged part of the way from the forests by buffaloes or carted directly to the depôt. No elephants being used in the exploitation of these Supa forests the logs are never of very large scantling. When the trees are in easily accessible places the contractors sometimes bring in pieces of over two tons. The general average size of logs is about 3 khandies or three-fourth ton each. The price of teak has been steadily advancing of late years, and as railway and mining companies are extensive purchasers the bidding at the auctions is usually animated. Rupees 80 a ton of 50 cub. ft. was the average of the last teak sale. This rate was, however, only about half of that obtained some time after the great American Civil War. At that (1866) sale teak logs fetched as much as Rs. 180 a ton. The ryots were well off in those days. Colonel Peyton used to relate how a purchaser at this sale arrived in the depôt carrying a heavy bag of rupees on his back. After walking about and selecting his requirements he went up to Captain Peyton and throwing down his load of rupees with a sigh of relief said "Saheb, I have selected such and such logs; take what you want and give me back the remainder"—"Bancheso dev." The Southern Mahratta ryots waxed rich in those days over the sale of their valuable cotton. They were, however, usually thriftless, some of them going so far as to fit their common cart wheels with silver tyres. The period of prosperity soon turned into one of adversity, and many of these same ryots, who did not know how to spend their money a few years before, died miserably of starvation during the great famine of 1876-77. There were no sales of Kanara timber at Haliyal during those years, and the effects of this famine period influenced adversely the value of timber for a

long time afterwards. Of late, however, the price of teak has greatly advanced. Several of the large Railway Companies, Great Indian Peninsular, Southern Mahratta, etc., have become large purchasers of Haliyal teak, and as the supply is strictly limited by the conditions of the working plan, the increased demand for a limited quantity of material has considerably enhanced the market rate of teak.

The differences and merits of the two kinds of teak timber, *viz.*, Malabar or Kanara and Burma or Moulmein, are well known to the readers of the *Indian Forester*. Haliyal was the chief depôt in Bombay, Western India, for the sale of the former, and as such a notice of its abolishment was likely to prove of interest. The future of the new establishment at Tawargatti will be carefully watched by Bombay foresters and others interested in the timber trade of North Kanara.

CORRESPONDENCE.

FIRE PROTECTION AND OTHER MATTERS.

In the number of the *Indian Forester* for May 1904, in the final paragraph of my letter on fire conservancy, I made a statement of fact which was true a dozen years ago, but now admits of some modification. I also used the words "pharisaical attitudes," which I now regret as possibly hurting some feelings and raising anger without producing an equivalent benefit in the result.

Our Department has now to accept the existence of a schism in the form of the "Burma School," upholding as its device the motto that fires are good for teak forests. The new school in the ardour of its novelty goes so far as to say that fire protection is the upstart, and that fires have always been a condition of teak existence and regeneration. This latter assertion I utterly scout, though I can no more prove that fires were not annual a century ago than my opponents can prove the contrary. The school appears really to base its existence on the single observed fact, which it cannot explain, that in some cases more teak seedlings have been found in burnt forests than in unburnt.



To return, I wrote that it would be possible to "walk from Bombay to Surat and Khandesh without finding a single sound teak seedling, and very few young teak seedlings of any kind." I am not sure that the above statement is not still literally true, but never the less, since I last knew this district there has been a marked change which ought to be recorded. The change consists in the fact that there are now plenty of places (in the less populous parts) where teak seedlings of a sort may be found. I do not say sound ones, for most of them show signs of two or three dead shoots, and are consequently in truth coppice shoots already infected with unsoundness. Seedlings that have germinated and become saplings without a hitch are extremely rare, so far as I have yet travelled. The reason of this remarkable change is quite indisputable, and it does not bear out the views of the Burma School. The *deus ex machina* is here simply the Collector!

Of all the matters that strike the eye of the forester in touring these forests, the only matter which is self-luminous and loud is the connection between the state of the forests and their frequentation. Other matters have mostly to be sought for and examined into. This one speaks for itself, and through a megaphone. *The state of the forest is inversely proportional to its frequentation.* Wherever people and cattle swarm the forest conditions are very bad, and seedling regeneration practically absent. The crop is pure teak because everything else has been exterminated. The extermination of the teak itself is only a matter of time unless more effective measures are taken in the interests of regeneration. Even teak forest cannot live on coppice alone. The most retired forests of the ghats have been destroyed by *dalhi* or *kumri* cultivation till there is very little left available for State needs, but what is left is mixed forest with comparatively little teak, and it is here that seedlings of all kinds are to be found. The trees themselves have mostly been hacked or injured by fire, but the conditions are still good because frequentation is less. Nevertheless, even here some of the few blocks reserved are approaching the coast type through cattle-breeding. We have been brought up in the doctrine that oxen are respectable citizens, who

live by munching grass quietly, casting no roving eyes to see what else they may devour. How many of us have yet realised the fact that Indian cattle do not recognise these limitations? *Indian cattle are browsers*, and it is lucky they possess neither the agility nor the enterprise of the goat.

The most offensive forms of frequentation here are fires, grazing and the cutting of *tahal* (or branches, seedlings, bushes, &c.) to burn on the seedbeds for rice. Behold now the intervention of the *deus ex machina*. In former days, as I wrote last May, fires raged throughout with sickening frequency, and those portions of forest that were not burnt once were either bare rock or burnt twice. Recently it has been my privilege to see in various places the grass of last year rotting still on the ground, and to note actually the formation of a vegetable soil on top of the former washed-out mineral. In fact, the fires have received a check. This is in nowise due to the efforts of my colleagues (may they pardon me for saying so) for the Department has always done its utmost. It is simply due to the Collector. For the last dozen years or so there has been an officer who has worked very hard and very honestly, and has succeeded in convincing his subordinates that he means it. To him is due the whole credit of diminished fires.

For diminished general grazing we have to thank the sad famines of past years. These have rid us of many poor beasts that lived only to convert forests into manure. There is still overgrazing in some places, and in such places the outlook is bad. The administration of the grazing rules, taken out of the hands of the Forest Department and placed in those of the village officers, I am told, has become largely a dead letter. Nevertheless, I believe the grazing in closed *coupes* has diminished, and this again must be placed to the sole credit of the Collector, for this Department has not for many years been allowed a free hand in the suppression of illicit grazing. The destruction of forest by *tahal* cutting has been largely obviated by practically disforesting the forest affected, but there are still important areas of reserved forests where neither shoot nor seedling can establish itself.

Now, the forests where the improvement has taken place have experienced no change of climate or any natural cause to account for it. The only change has been a diminution of grazing and of fires in both closed and open portions. Both these agencies are important, but there can be little doubt that the more important of the two is fire. The result has been a real improvement in regeneration wherever the protection has improved. As the soil improves under protection the regeneration will also improve.

I do not know much about the typical pure teak and bamboo forests where bamboo suppresses the teak, though there is an approximation thereto in the Kanara forests; but I know a good many mixed teak forests both under heavy and light rainfall, and do not think we in Bombay need be in the least fear of teak seedlings being extinguished by shade. I cannot recall a single case of teak seedlings suffering anything more than inconvenience, from shade alone, anywhere north of Belgaum and Dharwar. In Burma and Kanara it may happen, but I must say I am not in accord with the Burma School any more on the question of teak suppression than on that of fires.

F. GLEADOW.

P. S.—I have only just received my *Foresters* for October—December, and have not had time to read them, but note with pleasure that the discussion on fires, &c., is taking a more reasonable course, and is now coming down to what I originally demanded, *viz.*, precise details.

There are one or two points on which I may be permitted to express a cursory opinion *en passant*. The first is the article by "More Light" on proportionate fellings. I am glad to see he goes still further than myself and thinks the method applicable even in half ruined forests, but the suggested procedure appears to me to savour rather of the method of storeyed forest than of proportionate fellings. The next is Mr. Ryan's article on Root Suckers. These are a very common mode of spreading, quite apart from injury, both in Europe and in India, but the species that do so to a profitable extent are less numerous. Among the hardwoods that do so on a commercial scale one of

the most important is *Sissoo*, D. Sissoo. Among the underwood *Randia uliginosa* seems to become gregarious through this means. *Populus euphratica* is another instance, as stated by Mr. Ryan, but in Sind this tree is distinctly characteristic of flood waters. It sometimes comes up after a flood like grass. Consequently very many cases supposed to be root-suckers must be simply root-weldings, the mixed roots of independent seedlings having become joined by contact and pressure. I have seen teak plants, apparently suckers, which I should be sorry to state were really suckers for the same reason, but the teak no doubt does throw up suckers. Our real difficulty lies in keeping down fires and cattle trespass. Once this is accomplished there will be no need to trouble about suckers as an aid to regeneration.

My third point is Mr. Ryan's article on *Bassia*. *Mowra* seed is quoted commercially in various papers, but that is no reason why we should encourage it. Spoiling the ship for a ha'porth of tar is one thing, but there is a parallel operation, *viz.*, ruining the forests for the half penny. I thoroughly agree with the "certain Collectors and the Commissioner of Customs and Abkari" on the subject, though on different grounds, and should be only too pleased to see the *mowra* tree exterminated as being the cause of more fires than all its produce is worth. Taken all through, minor produce often means a visible farthing in the hand and an invisible but real damage of a sovereign to the estate.

My last reference is to Mr. Hodgson's article on 'Certain Important Forest Questions,' p. 468. The statements on this page as to germination support my position, but the author is in error in supposing that the existing open forest of pure teak and grass is a natural formation in Thana and Surat. The forest is pure teak because fires, rab, and grazing have killed out everything else. Teak, being a royal tree, has been less hacked, where everything else was cut down annually. The forest is open grass simply because the fires and grazing render regeneration impossible. Under present conditions the reduction of some important areas to complete stony barrenness is only a question of time.

F. G.

THE LIFE OF RAILWAY SLEEPERS IN BURMA.

Some very interesting statistics on the life of railway sleepers in India are published from time to time, and it is often asked why Burma does not contribute. The following incident will show how little interest in the matter is taken by the Burma Railways Company, Limited, which is especially to be deplored seeing that sleepers are exclusively made from *Pyinkado* (*Xylia dolabriformis*) which is now becoming so scarce in most accessible places that *jarra* is being imported. There are doubtless several other suitable woods in Burma, but they must be tested experimentally before being tried on a large scale.

In 1901 sleepers of 12 species were treated by the Haskin Process and handed over free to the Railways Company for experiment. After one year's trial they were taken up for examination with the following result :—

Didu (*Bombax malabaricum*) was completely eaten by white-ants.

In (*Dipterocarpus tuberculatus*), *Kanyin* (*D. laevis*) and *Kusan* (*Hymenodictyon thyrsiflorum*) were partly rotted at the ends and underneath.

Yemane (*Gmelina arborea*) was just beginning to be attacked. *Thabye* (*Eugenia* sp.), *Huaw* (*Nauclea cordifolia*) and *Tankkyan* (*Terminalia tomentosa*) were in good condition and *Thilpyu* (*Albiggia odoratissima*) and *Kokko* (*A. lebbek*) showed no signs of wear.

In June 1902 the Railways Company reported that with the exception of *Didu* all the sleepers had been put down again for further experiment.

On the 1st December 1904, in response to further enquiries, they reported that "the sleepers were put in the line in May 1901, and were taken out in May 1902 in a very bad state of decay."

The experiment therefore comes to an abrupt conclusion.

CAMP :

H. S.

The 21st January 1905.

WORKING PLANS.

Whatever may be thought of the other suggestions contained in "X. Y. Z.'s" letter on "Working Plans" in the January number of the *Indian Forester*, the one in which advice is tendered to working plan officers as to the manner in which they should set about their work would seem under the circumstances to be somewhat unconvincing. He says "I have written one working plan myself, but there was little or nothing original in it. I read every plan on similar lines that I could get hold of, and made use of everything in them that I could. In my opinion every working plan officer should do the same." It seems questionable if the more or less hasty assimilation of a vast number of facts about forests one has never seen is of any real assistance. In order to pass an examination or to write an article some such preparation would doubtless be desirable; but the officer in actual charge of the preparation of a working plan would seem to be somewhat differently situated. He has at his back the Conservators and Inspector-General, who have all the facts at their fingers' ends, and who must of necessity, from their much longer and more varied experience, be infinitely more capable of handling them properly than he is himself. May he not then possibly do better without this preliminary excursion round the bookshelves? It seems doubtful also whether the summaries suggested by "X. Y. Z." would be of much assistance, as the facts would be still more indigestible in this form than in their proper places in the original working plans.

6th February 1905.

C. C. HATT.

THE MADRAS FOREST MEMBER'S TOUR IN ANANTAPUR.

Being now in charge of this district, I have read with considerable interest the remarks of your reviewer on the tour of Mr. Sim, I.C.S., and though I agree with many of your conclusions, in two respects I beg entirely to differ.

(1) It is stated that the growth on the hills in this district is now miserable and will never be good. The first part of this premise is true, though in many cases the every-day requirements of the

population are now met; but I very much doubt the accuracy of the second part of the statement. There can be found to-day on the ground stumps of trees which must have been very considerably larger than any trees now in existence. There are also the massive beams of the gallows which have been erected in several places in this district, and which date back approximately to the time of Sir Thomas Munro or to approximately 1820. This was at a time when, apart from the fact that distance rendered it prohibitive to import timber of such size, it was necessary to hang dacoits, for whom the gallows were made, as soon as possible after capture. I am of the opinion that the wood must have been procured locally. Furthermore, according to the "Memoirs of the Geological Survey of India," by W. King, B. A. though there is a decided difference between the formation of the Nallamalais in Kurnool and the hills of this district, yet the difference is not so marked as to prevent the latter from reproducing a timber of a size similar to that which the Nallamalais can and does produce.

I would rather say that the reason why this district is impoverished is due to two causes; the one is overgrazing, the other is bangle kilns. I start with the presumption that these hills for the reasons above stated were covered with forest, but after the introduction of British rule every one began to keep for himself flocks of goats, sheep, and horned cattle which grazed indiscriminately over the hills, which in this district are practically isolated and in close proximity to the villages. This grazing no doubt retarded regeneration. The damage, however, thus caused was small compared with that caused by bangle kilns. In this district there are large areas of "chouder" or saline earth, quite uncultivable but absolutely necessary for the production of bangles; wood is also another essential, and in all sorts of out-of-the-way places it is possible to come across abandoned kilns. Mr. Peet in his inspection of the district in 1888 left it on record that there were, as he ascertained, 93 kilns, of which only 18 were then working. This was for one taluk out of eight, and though I admit there were more kilns there than I have seen in any other taluk, yet further comment is almost, unnecessary. The

owners merely stopped working because the supply of wood ceased ; the "chouder" will continue until the land is properly reclaimed.

(2) You mention that anything short of an absolutely impassable fence throughout its entire length is practically worthless. To criticise is easy, but it is far more difficult to state a remedy. The reserves in this district are, owing both to their present inferiority and also to the enormous number of scattered hamlets in their close proximity, primarily grazing reserves. It is admitted on all sides that heavy grazing must practically cease, of late years a surplus of from half to two-thirds of a lakh of rupees having been realized from this source. Little or nothing has been spent in improvement of growing stock, and the fence so proposed would not only afford considerable employment but would also spread abroad the fact that the Forest Department is endeavouring to grapple with this question in an enlightened manner.

As regards the low stone walls erected in 1876, why they were put up where they are it is difficult to say ; but I should say that they were made simply as the exigencies of the famine demanded. There are many better areas left unwallled, but the walled areas contain, except in one case, considerably better growth than is to be found in the immediately surrounding lands. The walls have, I think, justified their existence, and they are to-day practically intact ; nothing that we can build will keep out a man who intends to get in, but what is built may even though interrupted have a moral effect. The ryots of this country, as in the case of the farmers at home, surround their fields with a fence. Nobody could pretend that such a fence is absolutely impassable, and yet I would venture to say that such fences do have their moral effect. I often remained the right side of the fence at home simply because I did not know if I could get back fast enough to my gap when an infuriated farmer hove in sight.

There were also, so far as I can gather, no reserves in this district prior to 1883, that is, shortly after the arrival of Sir Dietrich Brandis. Before that period there were only a few topes in charge of the jungle conservancy. I would also mention that the idea for

this district of live fences, which of course have to be started behind a fence of thick dead thorn, did not originate with me but with Mr. A. W. Lushington, the then Conservator, and we are to-day only experimenting with a theory proposed by Sir Dietrich Brandis over twenty years ago and which according to his "Suggestions regarding Forest Administration in the Madras Presidency" (page 168) has succeeded well in Ajmer. *Euphorbin tortalis*, *E. antiquorum*, and *E. trigona* are exceedingly common in this district, and is it to be held at once without experiment that the proposals of Sir Dietrich Brandis are too Utopian?

ANANTAPUR :
28th February 1905.

B. H. BARLOW-POOLE.

REVIEWS AND TRANSLATIONS.

FOREST ADMINISTRATION REPORT OF THE N.-W. FRONTIER PROVINCE, 1903-04.

The Annual Report of the Hazara Reserved Forests is this year usefully supplemented by a brief interesting note on the management of the Village forests drawn up by the Deputy Commissioner. To this report we propose to allude later on.

During the last few years the entire management of the Reserved and Village forests in its bearing on the agricultural population has come under review in connection with the current settlement operations, and practically all the questions which had been the subject of acute and lengthy controversy since the first Hazara Forest Regulation was passed in 1873 have been disposed of. Within the past year orders have been passed regarding the redemarcation of the remaining two ranges, Khanpur and Dungagali, and all that now remains is to complete the Forest Survey and secure agreement between the Forest and the Village maps.

Working plans for the Khanpur, Siran and Dungagali ranges are now being prepared by the Divisional Officer in addition to his other duties, and when these have been completed all the

forests will be under systematic plans of working. The provisions of the Kangar Working Plan were in the main carried out, considerable progress being made towards clearing off the arrears of prescriptions. Deodar seed was again very scarce, however, for the third year in succession, and little could be effected in the way of the prescribed cultural operations.

Owing to the inadequacy of the staff not much progress is at present being made with road making and repairs, but it is satisfactory to note that houses are being erected for the subordinate staff, more especially in the hills.

There is a most satisfactory decrease in the area fired over (2,902 acres as against 6,112 in 1902-03), and this is attributed to the prompt action taken by the Deputy Commissioner in enquiring into cases and to enforcing village responsibility where the fires, as is usually the case, are incendiary. It appears that in these forests the fires are not only lit in the first instance by the villagers but are *kept alight*, and the people who attend nominally to put out the fire spread it by lighting the forest in other directions. With such a state of affairs the recognition on the part of the Chief Commissioner of the energetic action taken by the Civil Authorities to put an end to this practice cannot but have the best results on this important part of the management of the Forest Estate.

The experiment of regulated firing was tried in Deodar in certain village forests under the direct supervision of the Deputy Commissioner. The areas were subsequently inspected by the Conservator, who was of opinion that the treatment was not conducive to the continuance of the forests as tree-bearing areas, and moreover that the young grass, which sprouted after the fire, was entirely spoiled in many places by the fall of needles (the forests consist of *Pinus longifolia*) which is much heavier in burnt than in unburnt areas. The Chief Commissioner is however not yet satisfied that the experiment has had a sufficient trial, and the Deputy Commissioner was instructed to proceed with it in selected areas the following cold weather. It will be interesting to hear the result of this measure.

Transplanting operations of deodar seedlings apparently failed through insufficient staff and owing to a hot and dry autumn.

The felling and lopping of blue pine and other inferior species dominating deodar was carried out during the year. The Divisional Officer recognises that much damage may be done through ignorance in this operation, and therefore himself sounds the warning note. We would suggest that the operation is one which should not be followed blindly, as it appears that the benefits which accrue are not always as advantageous as was previously supposed. That the operation in the case of blue pine, spruce, &c., undoubtedly leads to a very considerable increase in the numbers of certain bark-boring beetles (*Scolytidæ*) in the N.-W. Himalayas is not open to doubt, and it has become apparent that some of these will attack the deodar under certain conditions.

The produce of the forests is extracted by departmental agency and also by the sale of standing trees to purchasers, the amounts of timber removed being approximately divided between the two. The total timber extracted including free grantees amounted to 945,716 cub. ft. Fuel is nearly all removed by purchasers, the amount rising from 189,000 cwt. ft. in 1902-03 to 417,000 during the year under report.

The income of the year showed a rise, the figures being the highest on record, as is carefully pointed out in the Resolution on the Report.

		Revenue.	Expenditure.	Surplus.
		Rs.	Rs.	Rs.
1902-03	...	99,148	56,034	43,114
1903-04	...	1,00,940	64,188	36,752

We quote the following from the Chief Commissioner's Resolution :—

"The statistics show that there is a steady and substantial increase in the amount of timber and fuel extracted from the forests,and there is reason to believe this will be maintained. It is therefore the more necessary to make timely provision to meet the increasing demand by improvement of the road and river

communications, and the Chief Commissioner trusts that more will be done in this direction.....

"There will probably be no difficulty in obtaining the necessary funds if the financial results are more clearly exhibited."

The Chief Commissioner recognises that Mr. Monro's duties have greatly increased, and further temporary establishment has been sanctioned. It is trusted that this will be made permanent.

In his brief report on the Village Forests the Deputy Commissioner points out that the new rules having only recently come into force, it is impossible as yet to make any statements with reference to their working. The main result would seem to have been to stop the sale of timber and considerably reduce the sale of firewood from guzaras. This is undoubtedly to the advantage of the people, and there are some signs that they are beginning to recognise the fact. The indirect result has been to throw more work on the Department and to increase the demand for timber and fuel. The general policy of the new rules appears to be to save the Village Forests from the rapid denudation which was overtaking them. To still further this object the question of imposing a tax on sheep and goats has been raised, and will be considered during the year. As reproduction is impossible of attainment with flocks of these animals roaming over the forests, we trust that this step will be taken. Bostan Khan, Naib Tehsildar, who is assistant in charge of the Village Forests under the Deputy Commissioner, gave complete satisfaction.

THE TOPOGRAPHY OF BRITISH INDIA.

India. By Col. Sir T. H. Holdich, K.C.M.G., K.C.I.E., C.B., R.E. With eight coloured maps. *The Regions of the World.* Edited by H. J. Mackinder (London : Henry Frowde, Oxford University Press. Price 7s. 6d. net).

Sir Thomas Holdich is too well known in India to render any introduction of the author of this book necessary. The work forms one of a series entitled *The Regions of the World*, edited by

Mr. Mackinder, of which *Britain and the British Isles*, *Central Europe*, *The Nearer East*, and *North America* have already appeared. *The Far East*, which should prove of as great interest to Anglo-Indians as the volume under review, is in the press.

In his short preface Colonel Holdich informs us that he was carefully warned against the inclusion of statistics and details, and he has therefore chiefly relied on descriptive methods of treating the infinite variety of the geographical configuration and the geographical distributions of India. British India and Burma together occupy 905,000 square miles of the Continent of Asia and the Native States and Dependencies of India absorb 611,000 more. This is exclusive of Baluchistan (130,000 square miles). The total population of this area amounted to 231,000,000 by the census of 1901, or about 15 per cent of the entire population of the world.

With climates varying from the ice-bound deserts of the higher Himalayas and the rain-steeped forests of Tenasserim to the barren desolation of Makran, where at one time of the year fire is almost unnecessary, even for cooking, and at another the cold blasts almost render human habitation impossible; with inhabitants who number races unsurpassed as brave and fierce fighters and races among whom cowardice is regarded as no disgrace; with customs, laws, literature and arts essentially at variance with Western notions in these matters—such is India, a name merely or rather a geographical expression for the territories administered by the Indian Government. To describe such a country within the limits of a book of moderate compass required a masterhand, and such has been found in the author.

The Indian Empire is composed of two parts, each of which may be regarded as a geographical unit, and each geographically distinct from the other. The larger and more important of the two may be regarded as India proper, and consists of the alluvial plains of the Indo-Gangetic river system and the triangular area known as the Peninsula. It is cut off from Burma by a tract of mountains impassable by reason of the deep-cut network of

valleys and the dense vegetation with which their slopes are covered, and on the north it is bounded by the mighty range of the Himalayas. Both these barriers have proved effective against either ethnical or military invasion, but on the west are the semi-desert hills and open plains of Afghanistan and Baluchistan, which have been repeatedly traversed by invaders. It was across this region that came, not only the great prehistoric Dravidian and the semi-historic Aryan invasions of India, but also the military invasions of Alexander the Great and of the successive Mahomedan conquerors of India. Until the improvement of navigation brought in the nations of the West it was the only route by which invasion and conquest was possible.

The historical invasions from Alexander downwards have been purely military : they have left their impress more or less deeply marked on the religion, the administration and political geography of India in buildings and public works, but they have hardly affected the great bulk of the people who derive their origin from the earlier invasions.

The other unit of the Indian Empire is Burma, which belongs geographically rather to Indo-China than to India. Cut off from the latter by a band of forest-clad mountains, which has rarely been traversed, it received centuries ago its religion and philosophy from India, but has remained unaffected in all other respects, and maintained its ethnical distinction untouched. This isolation is now at an end, and the gay, picturesque, pleasure-loving Burman, who had evolved an epicurian philosophy and regarded life merely as something to be enjoyed, is being ousted by the plodding unattractive native of Bengal and Madras.

Across the north of the Empire runs the great mountain barrier of the Himalayas, the highest and greatest mountain range in the world, which separates the Mongolians of Tibet from the races of India, and has left its impress on their mythology and folklore. This is given a chapter to itself, but the author abstains from formulating any theory of the Himalayas.

On the subject of Afghanistan it is worthy of note that the author considers, that the country will in the future have to look to

its forests and resources in silk, camel-hair clothing and wool for further financial development, since every available acre is already cultivated. We trust, should this be the case, that the Amir will be guided in the management of his forests by the opinions of trained experts rather than by those of the lumberer, for the advent of the latter into a country like Afghanistan would be disastrous.

To all interested in the study of the Fauna and Flora of India or in its geographical peculiarities we can confidently recommend this fascinating book, perhaps not the least interesting portions of which are its excellent maps.

A TURPENTINE CONCESSION IN BRITISH HONDURAS.

A correspondent has very kindly forwarded the following translation of a note in the *Revue des Eaux et Forêts* of 15th February 1905, which is itself a translation from the *English Board of Trade Journal*:—

British Honduras—Concession of Turpentine.—According to an agreement between the Governor of British Honduras and an American this latter, in return for the privilege of collecting the turpentine of 12,500,000 pines, engages to pay one cent per pine. For the concession, which is granted for 26 years, 125,000 dollars are to be paid within two years from now.

According to the terms of the agreement all the products of the pines obtained by the grantee will be exempted from all export dues, and the material and tools necessary for cutting or tapping the pines and for the manufacture and transport of the products of the pines will be admitted free from importation dues.

On this subject the United States Consul at Belize reports that the exploitation of the pine forests of British Honduras will necessitate large purchases of machinery and of food for several years. Nearly one-third of the Colony is covered with pines, and, although the trees are not of large size, the wood is very hard and rich in sap.

The concession has been given especially with a view to the manufacture of the turpentine and to the exportation of the timber, but the industries (*entreprises*) which it will develop as a consequence will not be limited to these projects alone.

Tramways, permanent roads, and the development of agriculture will certainly follow, and the utilisation of the unexplored lands of the Colony will be effected, or at least greatly encouraged.

The writer in the *Revue des Eaux et Forêts* adds the following remark of his own :—

The Governor of British Honduras appears to us to have chosen a rapid and certain method of ruining the forests and the Colony.

SHIKAR, TRAVEL AND NATURAL HISTORY NOTES.

TWO NEW INDIAN RUMINANTS.

SPORTSMEN will be interested to learn that two important additions have recently been made to the big game fauna of the Indian Empire. A short time ago that well-known Burmese sportsman, Captain Evans of the Veterinary Department, sent home to the British Museum the skins of two gorals from the interior of Upper Burma, which, on examination, proved to indicate a perfectly distinct species. For this species an appropriate name has been selected. That the Burmese goral would turn out to be an undescribed form has long been expected, but the one specimen previously received in England was insufficient to determine this point with any approach to certainty. The animal is a brownish grey species, without any distinct dark dorsal stripe or dark streak down the front of the legs, and with a yellowish throat-patch. While examining the skins of Himalayan gorals in the collection of the British Museum for the purpose of determining the Burmese species, an altogether surprising and totally unexpected discovery was made, namely, that there are two

perfectly distinct kinds of goral in the Himalayas. In several books on Himalayan sport, such as the late General McIntyre's "Hindu-Koh," the Himalayan goral is described as a grey animal with a large white patch on the throat and sides of the face; and an animal of this type, from Chamba, is now living in the London Zoological Gardens, where it is labelled as being the true goral, *Urotragus* (or *Cemas*) *goral*. A similar specimen, presented by the Duke of Bedford, is exhibited in the British Museum.

On turning, however, to Blanford's "Mammals of British India," we find the goral described as a brownish ruminant (with a tendency to grey) characterised by the presence of distinct blackish dorsal stripe and of dark stripes down the front of the legs, as well as by the possession of a white throat-patch. Skins collected by Brian Hodgson in the Nepal district agree in all respects with this description. One example in the same series (in the British Museum) is, however, of the above mentioned grey type, and has apparently been regarded as indicating a colour-phase or immature example of the typical species. It was probably this specimen which induced Dr. Blanford to state that the ordinary Himalayan goral exhibits a tendency to greyness.

The grey goral, as the new species may be called, differs from the typical brown goral not only by its light grey colour mingled with black, but by the circumstance that the pure white patch on the throat extends on to the sides of the face, by the absence of a distinct dorsal stripe, and by the forelegs having a dark knee-cap, but being elsewhere of the same hue as the body, instead of with a continuous dark stripe down the entire front surface.

The Chamba specimen living in the London Zoological Gardens, together with the mention of grey as the colour of the animal by General McIntyre, indicates that the grey goral is the representative of the genus in the Western Himalayas. The brown, or typical, goral, on the other hand, as indicated by the specimens collected by Brian Hodgson in Nepal, is doubtless a native of the damper and hotter districts of the Eastern Himalayas; animals inhabiting countries of the latter type being

generally of a darker tone of colour than their relatives from drier, cooler, and more open districts.

Information as to the precise ranges of these two Himalayan gorals is, however, much needed ; and this can be supplied only by sportsmen and collectors in India. The occurrence of a specimen of the grey goral in the Hodgson collection may probably be taken as an indication that this species (as well as the brown goral) is found in some part of Nepal or the adjacent districts of the Himalayas. Possibly the brown species may inhabit the damp Terai area, while the grey species is confined to the drier zone immediately above. It has, however, still to be determined whether the brown goral is really a forest species, for in Chamba and Kashmir goral are, I believe, found in grass country dotted over with low bushes rather than in forest. The matter may be commended to the best attention of sportsmen, more especially those who have the opportunity of shooting in the Terai district. A good skin of the brown goral would be very welcome at the British Museum for exhibition purposes. Captain Evans is to be congratulated on obtaining the specimens which led incidentally to the addition of two species to the Indo-Burmese fauna.

R. LYDEKKER, in the *Indian Field*.

THE CLOSE SEASON FOR JUNGLE HENS IN THE NILGIRIS.*

The Committee of the Nilgiri Game Association recently approached the Revenue Board with a proposal that the close season for jungle hens, which at present commences on 1st January, should in future beg in on the 15th December. The alteration was recommended because it has been found by experience that jungle fowl begin breeding before the end of December and that considerable damage is caused by the shooting of hens during the latter half of that month. For the reason stated the proposed

* From papers kindly placed at the disposal of the Hon. Editor by the Government of Fort St. George.

alteration was recommended. The Board after a consideration of the case supported the Game Association's proposal, the Government being asked to substitute 15th December for the 1st January in Rule 3 of the Nilgiri Game Rules.

In their reply Government stated that they were unwilling to accept the proposal of the Nilgiri Game Association, which would involve the prohibiting of the shooting of jungle fowl during the Christmas holidays, and created a close season of nine months throughout the whole of the Nilgiris. In their decision they quoted chapter and verse from Blanford (Faun. Br. Ind. *Birds*, iv, 85) "the time of breeding (for jungle fowl) varies: March and April on the Eastern side of the Nilgiris, October to December on the Western, but generally from March to July." This would make the proposed open season the breeding time as far as the Western Nilgiris are concerned.

The Board was requested to ask the Game Association to consider the question further and to report whether a shorter and different close season should not be prescribed for the two sides of the district.

It seems a pity that the Game Association did not reply direct to this question of Government, for it would have afforded some very interesting practical information. No one, and we are sure Dr. Blandford would himself be the very last, pretends that we understand all about the habits of the greater number of our game birds in India, and here we have a case in point, for there appears to be a considerable divergence of opinion as to the breeding season of even such a familiar game bird as the jungle fowl. The Game Association replied as follows to the Government question :—

The Committee beg to point out that the proposal does not involve the prohibition of shooting *jungle fowl*, but only of jungle hens, which require special protection during this period. Jungle cocks can be shot up to the 15th March.

The experience of a large number of the Committee is that the breeding season of jungle fowl throughout the Nilgiris does commence before the end of December and continues during the

spring months. The Committee again recommend the proposed alteration.

The Board again referred the matter to the Association for an answer to the Government question, and obtained the opinion that 'there should not be a different close season for the two sides of the district nor does it consider that the breeding season begins in October in any part of the district.'

The Government reply was that it did not see any sufficient reason for altering the existing close season. We regret that in the interests of the bird the Game Association did not take the trouble to substantiate their case. To merely make a statement without bringing forward a particle of evidence, especially when the case is one easily ascertainable and of interest to sportsman, naturalist and scientist alike, is scarcely the procedure one would look for from an enlightened body such as the Nilgiri Game Association. We trust that it will endeavour to impress in a more satisfactory manner upon its members the fact that the bird does commence breeding in the latter part of December, and that the hens are consequently no longer 'game.'

EXTRACTS FROM OFFICIAL PAPERS.

A FOREST TRAINING SCHOOL IN MADRAS.*

It was suggested in Madras some years back that a school should be established at some central place for the training of the lower subordinates of the Forest Department. This proposal was made by Mr. Gass, Conservator of Forests, Southern Circle. In 1902 Mr. Gass again strongly urged the necessity of establishing a school in the Presidency for the training of Deputy Rangers, Foresters and Guards, and proposed that the school should be located at Coimbatore. The Board recognised the importance of elaborating a scheme for instructing Forest subordinates in special forest works and for instilling into them a greater pride and interest

* From papers courteously placed at the disposal of the Hon. Editor.

in their profession. It accordingly requested the Conservators to consider and settle the preliminary question as to what class or classes of subordinates are most in need of the improvement which such a training would afford.

After consideration of the Conservators' replies to this reference, the Board accepted their unanimous opinion that the training should be confined mainly to Guards and Foresters, but since it was impossible to expect men of the class from which Guards are appointed to voluntarily proceed for their education to a central school, established at a distance from their homes, the Board considered it advisable that one or two schools should be instituted in each circle instead of one for the whole Presidency as suggested by Mr. Gass. Proposals were accordingly called for as to sites, teaching staff, curriculum of studies, etc., for the proposed schools. These replies were carefully considered by the Board and were also discussed individually with the Conservators, and the conclusion was arrived at that one school for the training of Guards and Foresters should be established as an initial experiment in each circle on the following lines :—

- (1) The training to be in the vernacular and confined to practical field work.
- (2) The number of men to be trained not to exceed 20 or 25 for each circle.
- (3) Two courses of training of three months each to be instituted, one more advanced than the other, to be taken successively with an interval of a year between.
- (4) The instruction to be given by an officer by example as well as precept.
- (5) The Instructors to consist of an Extra Assistant Conservator and a Ranger or a Ranger and Deputy Ranger.
- (6) There should be three separate classes in each school, one for Guards (easy), one for Guards (advanced) and a third for Foresters.
- (7) The instruction to be entirely in the forest.
- (8) The Guards to be given a small addition of pay when they have satisfactorily passed through the two classes.

The Board in submitting these proposals laid particular stress upon the fact that a better trained set of Forest Guards and Foresters would be urgently needed if the works of improvement and exploitation which the Department must shortly undertake as forest organisation develops are to be successfully carried out. It would also be necessary to provide promotion for such men as an inducement for them to work hard and be honest. With this object the Board considered that in accordance with the opinions expressed by the Conservators, Foresters should be recruited mainly from the class of Guards ; while the Guards should be recruited mainly, but not entirely, from the local jungle or village class who are accustomed to rough outdoor life, and not from the class of semi-educated sedentary towns men who are not accustomed to such life, and who frequently take up such appointments merely because of their unauthorised emoluments. Guards and Foresters should be men who can really be trusted to do the work expected of them and to carry out the orders issued, not men who have their heads full of undigested and theoretical book knowledge and are incapable of doing practical work. For the above reasons the Board was strongly of opinion that a practical outdoor course of training in forest works (as distinguished from a school course) should be prescribed for Foresters and Guards in order to fit them for their duties.

After calling for further information as to the probable cost of the scheme and to the nature of the instruction it was proposed to impart to the men the Government issued orders in the matter. They recognised that in spite of the severe disciplinary measures (what these were, why needed or how they were to improve the staff is not stated) adopted in late years, the efficiency of the protective staff of the Department still left much to be desired, and they agreed with the Board that with the completion of the process of afforestation better men will be required to carry out the more specialised work. Whilst welcoming the proposal they however doubted whether the general education of the class of men from whom Forest Guards are recruited is sufficient to enable them to profit by the instruction which it is proposed to impart at the training

school; and they therefore consider that it would be advisable to exclude Guards from the scheme. The Department must look to the Ranger, Deputy Rangers and Foresters to get work from the Guards and keep them in discipline. On the other hand the class of Deputy Rangers, as at present constituted, includes many men with little training to fit them for the duties of their appointment; and it would be very desirable that such as have not had the benefit of training in the Forest School at Dehra Dun, nor are ever likely to be deputed there for want of the requisite qualifications, should undergo the proposed course of instruction along with the Foresters, unless they are over an age to be taught or are otherwise unfit.

Proceeding on the above basis the Government modify the scheme as indicated by the Board as follows :—

(1) There should be only one school, situated in some suitable central site in the neighbourhood of typical educational forests.

(2) The school to be conducted by an Extra Assistant Conservator of Forests assisted by a Ranger, subject to the orders of the Conservator of Forests.

(3) The school to be open to Deputy Rangers and Foresters and at their own expense to candidates selected for these appointments. Thirty-five years to be the limit of age. Subordinates holding the Dehra Dun certificate or who are likely to go there not to go to the local school.

(4) Course of instruction to extend over six months and two courses to be held in the year. There to be only one class consisting of ordinarily not more than twenty pupils.

(5) The curriculum to include—Elementary surveying, demarcation, fire protection, supervision and execution of works, elementary silviculture, drill and care of uniform. No attempts to be made to teach botany or any of the scientific aspects of forestry nor anything not common to the whole Presidency. Finally, the teaching to be in English.

Provision was made for starting the school from the beginning of the next official year (April 1905).

Whilst we are of opinion that the idea of the local school is a most excellent one we regret that the Government should have so modified the Board's original proposals as to greatly decrease the power for good of the new departure. Looking back we see that the original proposal was that the training should be given to Guards and Foresters. They come at the bottom of the Provincial Establishment. At the other end we have the Extra Deputy, Extra Assistant and the Ranger. Their training is provided for at the Dehra Dun Forest School. This leaves in between the Deputy Ranger. It is open to all these latter to go to Dehra, and it may be taken for granted that all the good men will, and do, do so. What is left? It is to teach the residue that the Board's enlightened attempts to improve the lower ranks have been upset. It cannot be advanced that these Deputy Rangers are prevented from attending the vernacular class at Dehra owing to a want of knowledge of Hindustani since the present proposal institutes English as the language of the new school. It is not therefore to teach the non-English-speaking Deputy Rangers, and in Madras these in all probability do not exist. We think that the deputation of these Deputy Rangers to attend the Foresters class at the Board's proposed school would have fully met the case. We cannot agree that the idea of educating the Forest Guards is an impossible one. The training proposed was an eminently practical one, and the sooner a Guard who could not have followed it was got rid of the better for the Department. It is considered quite possible to teach the ryot improved methods of agriculture and the use of better implements. Equally possible is it to teach the Forest Guard a practical knowledge of the work he is required to do, and his use in the forest would be increased thereby a hundredfold. Most Divisional Officers could tell how quickly their own personal peons, Ranger's peons, &c., pick up the forest work. The great essential is that they should be *shown* how to do things.

The Government's decision to constitute one central school instead of three we are inclined to agree with. Experience has always to be gained in these matters, and it is better to make mistakes in one rather than in three places at once. We would

suggest however that the Extra Assistant Conservator in charge should be placed under the Divisional Forest Officer of the division in which the school is located, the latter being directly responsible to the Conservator, since a number of questions and references, etc., will quickly crop up which will require a mature experience to decide upon.

As regards the curriculum the practical course in the forests would have been more useful. The present one has every appearance of being a poor modified adaptation of a portion of the Dehra School course and, in the time available, it could be little else. Contrary to the Board's proposals we should have advocated a six months' course to be spent entirely on practical work in the forest with a practical examination at the end of it. We do not think that the written certificate of the officer in charge would be quite a sufficient guarantee that a student had really assimilated what he had been taught.

MISCELLANEA.

DR. SCHLICH'S LECTURES ON FORESTRY AT THE ROYAL INSTITUTION.*

Dr. Schlich gave two lectures at the Royal Institution on February 2nd and 9th, the following being a short abstract of their contents.

The first lecture was on "Forestry in the British Empire." An account was given of the splendid results of forest management in India. Timber traders forty years ago were as anxious to work out unrestrictedly the splendid teak forests of Burma as they are now to have a free hand in the forests of Canada and Australia, but the wise statesmanship of Lord Dalhousie, acting under the advice of Dr. Brandis, prevented this by reserving the best teak

* W. R. Fisher, B. A., in the Land Agents Record.

forest in Lower Burma for State management, and since the conquest of Upper Burma, all the best forests in the whole of Burma have been gradually brought under State control, so that out of 66·3 per cent of forests under departmental management, there are now 18,000 square miles of finally settled reserves in that country. There were, in 1900, 81,124 square miles of reserved forests in British India, 8,845 square miles of protected forests, and 27,679 miles of forest still left as waste land, and this enormous area is managed by a superior controlling staff of 213 officers, most of whom have been trained at Cooper's Hill, 112 controlling officers of the Provincial Service, trained at the Dehra Dun Forest School in India, 437 rangers, also trained for the most part at Dehra Dun, and 9,759 foresters and forest guards—making a total staff of 10,508 forest officials in the Imperial Service. Besides the forests under State control, there are properly organised forest departments in all the principal Native States, which still comprise about one-third of the area of India, and wherein much progress in forestry is being made.

The area of forests in British India that is protected against fires is now 36,651 square miles, while 33,264 square miles are under working plans.

The gross revenue for the year ending March 31st, 1903, for the Indian State Forests was £1,298,103, calculated at 1s. 4d. per rupee, being £52,265 in excess of the average revenue for the last five years, while produce to the value of about one-sixth of this gross revenue was given free to the natives of villages bordering on the forests. The total expenditure for the same year was £749,956.

Besides the direct benefits to India resulting from the protection and improvement of her forests, twenty officers from the Imperial and Provincial Services were lent for foreign service during the year under consideration—in Ceylon, the Soudan South Africa, Malay States, South Nigeria, Siam, Trinidad Mauritius, etc.; while the application for others even by the Native States of India had to be refused owing to the shorthandedness of the staff.

Of other British possessions, Dr. Schlich stated that Ceylon and South Africa alone, and especially the Cape Colony, is properly managing its forests, wholesale destruction of forests without any corresponding protection proceeding in Australia and in Canada. While the splendid eucalyptus forests of Australia are being devastated, feeble attempts at planting new areas are being made at enormous relative cost. The only satisfactory method, of at once selecting large areas of reserved forests, constituting a proper forest staff to manage them, regenerating them chiefly by natural seedlings and cutting annually only the annual increment of the growing woods, has not been adopted. In fact, Australia imports more wood than it exports, while, independently of internal demands for timber, the maintenance of its forests, which are chiefly along the coasts, is required for climatic reasons.

In Canada, in spite of the still enormous areas of forests, waste and destruction still predominate. The forests of Weymouth pine are practically ruined, and the chief exports are now of spruce from the Eastern territories and of Douglas-fir from the West. A series of slides showed the magnificent Douglasfir forests in their natural condition, the construction of a skidway for removing the logs, and the final ruined condition of the forest, after the lumberers have extracted the best of the timber. The damage done to forests in Canada by fires annually is incalculable. Considering that the Dominion obtains a revenue of about £700,000 annually from its forests, it is now surely time to set apart at least half of this for protecting what is left, and above all to reserve a very large area as permanent State forest.

A series of slides showed that there is an annual deficit in the timber supply of the Empire, which can practically be met only by the conservation and good management of the Canadian forests. If the Dominion were to adopt the same wise policy that is practised in India, their forests would eventually be in a position to supply the world with timber to the permanent benefit of their own treasury and people.

The second lecture was devoted to forestry in the British Isles. Most of the matter contained in this lecture was extracted from the pamphlets by Dr. Schlich, recently published by Bradbury, Agnew and Co., on "Forestry in the United Kingdom."

The æsthetic side of forestry was first discussed, and its importance for the formation of game coverts and for shelter to crops and cattle against gales. It was stated that deer bred in real woodlands have much finer antlers, and are in much better condition, than the Highland deer, which roam over immense tracts of heather, and that the rearing of pheasants is quite in accord with good forestry. The maintenance of rabbits was, however, said to be incompatible with that of woodlands.

The status of the proprietors of our forests was also discussed; the State in Britain manages only $2\frac{1}{2}$ per cent of our three million acres of woodland, which is only 4 per cent of our total area, less than in any other European country. Land is cheap in Ireland and in Wales, where Mr. A. D. Webster states that about 7,410 acres have recently been sold for £15,670, tithe and land tax free. Here it would certainly be good policy for the State to acquire wasteland and plant it. Half a mile away is growing a heavy crop of larch on similar land, and similar plantations that were cut down have paid 22s. per acre for about sixty years. Municipalities are doing something, as Liverpool and Birmingham are planting the catchment basins of their water-works, and this wise policy might be followed by other towns.

The uncertainty of our future supplies of timber was demonstrated, as there is a net annual deficiency in Europe of 2,620,000 tons of timber. Sweden and Norway are said to be felling more than the normal annual yield of their forests, while, although Russia and Finland still possess large wooded areas, the economic development of Russia promises ere long to require most of the timber it produces. The Siberian forests are very remote, and of very slow growth, and are being rapidly destroyed by fire by the increasing peasantry of that country.

The timber deficit of Europe is now supplied chiefly by Canada and the United States, but the increasing population of those countries and the defective management of their forests show that future Transatlantic supplies are of doubtful continuance. It is, therefore, surely time for the United Kingdom to reafforest large areas of its wastelands, which in England and Wales amount to 3,600,000 acres, with over 9,000,000 acres in Scotland and nearly 4,000,000 acres in Ireland. Nine million tons of timber, representing a value of £18,000,000, are now annually imported into Britain, which could be grown at home, and for this 6,000,000 acres of our wastelands should be planted.

The members of the English Arboricultural Society will next autumn have an opportunity of seeing how the question of the planting of wastelands has been dealt with in Belgium, where scarcely any land of this description now remains unutilised, and Belgium greatly resembles Britain in climate, so that we could readily follow their example. The strong gales which blew down so much timber in Scotland of late years are equally felt in the forest-clad mountain ranges of the Continent, but there proper measures are taken to secure the woods, and to prevent the fall of prices, when windfalls occur.

As regards the question of the unemployed, there are within reasonable distance of London, in the counties of Surrey, Kent, Sussex, Suffolk, and Norfolk, about 100,000 acres of wasteland. By planting this up, labour would be required during the winter, when agricultural work is slack. In this way, men would be kept in the country, instead of crowding into the towns, and increasing the numbers of the unemployed.

The fact that large compact areas of woodland were established would lead to the establishment of industries using wood as raw material, and would thus tend further to employ labour.

Regarding the question of economic planting by landowners Dr. Schlich had much to say. He rebutted the statement that our timber will always necessarily be inferior to foreign timber. The latter owes its excellence to the method under which it is grown,

as was shown by a number of excellent slides. Dense planting, deferred and light thinnings will produce cylindrical timber, even grained and free from knots, and our climate and soil are at least as suitable as those of North Germany for producing good timber.

The want of reliable statistics regarding the results of home timber growing was commented upon, and the excellent data to be obtained from German yield tables, the latter being fairly applicable to this country until we have data at home.

Slides were shown, giving the percentage obtainable by crops of larch, oak, Scots pine, and other trees, when planted on land of different values, it being shown that larch would yield $2\frac{1}{2}$ per cent on land worth £45 an acre, and oak $2\frac{1}{2}$ per cent on land worth £10. It was argued that $2\frac{1}{2}$ per cent is a reasonable percentage for timber, as the security is very good, while Consols, which nominally give $2\frac{1}{2}$ per cent, have not proved equally secure. A few years ago they stood at 112, but have since been quoted at $85\frac{1}{2}$ a fall of £26 10s. per cent, representing more than ten years interest.

The question was raised of unfair charges on growing timber, in rates and taxes, and the unfairness of charging rates for exceptional traffic on roads, when a mature crop is harvested, after paying uniform rates for many years, without the owner having utilised the roads. Preferential traffic railway rates for foreign timber also are paid by the landowner, for the timber merchants must allow for the excess freights on home timber, when they buy it, and the effects of this preference has been said to amount to £20 per acre for an average crop of 3,000 cubic feet of mature British timber, in some cases.

Dr. Schlich concluded this lecture by stating that forestry is not entirely based on botany and natural science, but that its financial aspect must be carefully studied, and this must be borne in mind in forestry education.

Dr. Schlich has now been engaged in forest work for about forty years. He did excellent organising work in the Indian forests, between 1866 and 1885, and rose to the position of

Inspector-General of Indian Forests. Since 1885, he has directed the higher forestry education of Cooper's Hill. He has also managed a large forest in Belgium, and has prepared working plans for the Duke of Bedford's woods and for some of the Crown forests. He has visited Ireland, and reported to the Government on the forest question there. He has brought out the "Manual of Forestry," part of which is now in its third edition, and has written pamphlets, and given numerous lectures on forestry, at the Imperial Institute, the Society of Arts, Cirencester, the Royal Institution, Carpenters' Hall, and other places. This country owes him a great debt for the part he has taken in rousing the country to the approaching timber famine, and to the necessity of introducing sound methods of forestry into Britain, and of properly utilising our wastelands, and especially to his exertions in bringing into prominence the economic aspect of forestry. It is to be hoped that he may now be permitted to complete his work by introducing a sound system of forestry instruction to one of our great universities, so that the future rulers of our Colonies, our land agents and landowners, may be able to get sound views of this great question, and a thoroughly competent staff of foresters and forestry instructors may be available. The Cape Colony has already sent its forestry students to an American forest school, and this shows the necessity of a good central school of forestry for the Empire.

DAMAGE DONE BY FIRES IN THE PROME DIVISION,
LOWER BURMA.

Mr. J. W. Oliver has very kindly sent us the photograph we show here with the following remarks :—

'View looking into the Bwet Reserve from the boundary fire line.

'Note the damage done to the *Pyinkadu* (*Xylia dolabriformis*) tree, *e*, by annual fires before the reserve was protected. The damage done to teak trees is often far greater. I am sorry that I have not a photograph showing such damage.'



J. H. Oliver, Photo.

View looking into the Bwet Reserve from the boundary fire line. **a**, *Schleichera trijuga*; **b**, *Homalium tomentosum*; **c**, Young and middle-aged teak in the background; **d**, Probably a *Terminalia*; **e**, *Xylia dolabriformis* (Pyinkado), damaged by fire at base; **f**, Probably a *Clerodendron*; undergrowth mostly bamboos.

The other trees depicted in the photograph are (*a*) *Schlichera trijuga*, (*b*) *Homalium tomentosum*, (*c*) young and middle-aged teak in the background, (*d*) probably a *terminalia*, (*f*) probably a *clerodendron*; the undergrowth is mostly bamboos and recent seedlings.

This photograph has been reproduced in Schimper's 'Plant Geography.'

EUCALYPTUS SCREENS AS FIRE PROTECTION BELTS.—A correspondent sends us the following extract from a letter received by him from Mr. Wroughton, late Inspector-General of Forests :—

'On my way back from South Africa I stopped at Cape Town where Hutchins showed me his work. He has done very well, and has threshed out the Eucalypts experimentally with the greatest success, and it seems to me that there are infinite possibilities in them for India. He plants Eucalypts, six rows 6' x 6', all round plantations, etc., and in five or six years they form a barrier which no fire can cross, for they kill out all the grass completely, and at the same time prevent burning leaves, etc., being blown across. He says there are Eucalypts to suit every kind of climate.'

This experiment is we think of very considerable interest, and it is not impossible that there are areas in India where these Eucalypt belts could be planted with advantageous results, not the least of which would be the decrease in the fire work of the staff, thus enabling them to give more time to other matters.

A TRIBUTE TO THE MEMORY OF THE LATE HERBERT SLADE.—A "Divisional Officer" sends us the following expression of the estimation in which Herbert Slade was held by his officers in Burma. It comes from one of the oldest and most respected of the Clerical Staff. It is here transcribed word for word: "I regret very much to have to state the death of Mr. H. Slade, our Conservator, and I now feel that you will also feel very painful to hear this sad news of so good and kind hearted a gentleman. I know that we can never find a friend like him any more."

• PARA RUBBER.—Much has been written of late upon the Para rubber tree (*Hevea brasiliensis*), its growth, the collecting and curing of the latex, and the diseases attacking the tree. The germination of the seed, however, does not appear to have attracted much attention. Although authorities appear to differ as to the requirements, etc., of the tree, there appears to be no doubt as to the methods of germination, which are as follows:—(1) Sow the seeds direct into pots; (2) make seed beds, and after sowing the seeds, cover them with from two to three inches of soil; or (3) sow at stake, *viz.*, out in the jungle, the scrub being cleared sufficiently to allow the young plant air and light. The general opinion is that the vitality of para seed is short and many failures are put down to this cause. It would appear, however, that the majority of failures are due to the treatment of the seed in its earliest stages. Deep burying of the seeds is a fatal process, as the heavy weight of soil upon the *micropyle* must cause undue exertion upon the *plumule* in forcing its way out; in doing which it is liable to be injured by the extra pressure. The injury thus caused forms a host for fungi which kills the plant in the embryo stage. Again, seeds to be germinated successfully require an even temperature and moisture; it is difficult to regulate the moisture when the seeds are sown three inches deep.

In these gardens we have been in the habit for the last three years of germinating seeds to supply to planters on the Nilgiris. The first year the plan of sowing direct in pots and pans was adopted with very poor results. In the second and third years a system on the plan of a seed-tester was tried. Platforms were erected about three feet from the ground, and on these old sacking was stretched (coir matting would be preferable). Over this was placed a little powdered charcoal to assist in retaining the moisture. The seeds were then placed on this and covered over with more sacking, and the whole kept damp by occasional watering. The seeds were examined every day, and as soon as any showed signs of germinating they were removed and potted off. Seventy-five per cent of a case of seeds received from Peradeniya germinated after this treatment, in spite of being delayed by the Madras

Customs authorities for over three weeks. —*Proc. Madras Hort. Soc., Oct.—Dec. 1904.*

CULTIVATION METHODS IN BURMA.—A large number of the hill people in Burma still adopt the *taungya* system of cultivation burning down a hill side of jungle and planting it with paddy, chillies, cotton, tobacco and vegetables for their own consumption. This spot is deserted after a few years, and another chosen, which goes through the same process. The Commissioner of the Tenasserim division suggested that this wasteful form of cultivation should be discouraged by a gradual enhancement of the rate assessed on each individual or family engaged therein, and the Financial Commissioner is at present conducting an enquiry into the circumstances of the *taungya* cultivators in Lower Burma. The present rate of Rs. 2 per cultivator, or family of cultivators, was fixed over a quarter of a century ago. It was then double the highest existing rate, and high as compared with the prevailing rates assessed on paddy land in the plains. It is not wonderful if it has now become inadequate in certain localities. In the Tevoy district the *taungya* tax produced a larger revenue last year than in the previous year, though there was a decrease of 998 acres under assessment. This was caused by an increase in the tax in 1902.

THE FORESTS OF CHILI.—In that fascinating book 'The Countries of the King's Award' by Sir T. H. Holdich, K. C.M. G., etc., which we can confidently recommend to our readers, we read "Another matter evidently needing attention is the forests. Much of southern Chili is forest clad, and these forests are almost unknown, and their capabilities scarcely explored. Where they can be got at the valuable woods are being rapidly exterminated for want of any system of conservation."

We should have mentioned perhaps that the book in question is not fiction, but deals with the country lately in dispute between the Argentine and Chilean Governments, which dispute they appealed to the King of England to settle for them.

A THORNLESS CACTUS.—Among the wonderful results of experiments with plant life that have been made by Mr. L. Burbank is the production of a thornless cactus. Mr. Burbank conceived the idea that if the prickles could be eliminated from this desert plant the many arid and waste lands of the States might be covered with fodder for cattle, and some large desert tracts in America are to be sown with the new thornless variety by way of experiment. If it turns out to be a success and the plant does not revert to the original armoured type, the new variety is likely to be as useful to India as the Americans hope it may be to the Western Continent. The Burbank grasses are already recognised as a valuable contribution to agriculture, as he has developed several varieties that will grow on arid plains otherwise devoid of vegetation. The American star-flower, which retains permanently its colour and perfume, the stoneless plum, larger in size than the well-known French plum, a lemon-coloured lily with the perfume of the violet are among the horticultural wonders that this lover of vegetable nature has produced.



H. C. Robinson, Photo.

Palaquium Forest in Federated Malay States in which the undergrowth has been cut back to set free the *Palaquium gutta* saplings.

INDIAN FORESTER

JUNE, 1905.

THE PROHIBITION OF GRASS BURNING AND ITS EFFECT ON THE GAME OF THE COUNTRY.

"Sahib! you are steadily driving us from our home on these hills. Why is the grass never fired now and why left to die down season after season, till it cumbars the earth with such a mildewed and powdery carpeting as none but the rankest herbage may penetrate when the rain comes down? The bison are going and we follow, and at no distant time these hills will stand yet more desolate, deprived of all that once gladdened their solitude." (Leaves from an Indian Jungle.—*The Autobiography of a Sambhar Stag.*)

Some most interesting papers have recently been issued with reference to the former annual burning of the grass on the grazing grounds of the Nilgiri plateau, its recent prohibition, and the resultant effect upon the herbivorous animals of the plateau. The subject in its bearing upon the distribution and preservation of the game, not merely of the herbivora alone but of the carnivora as well, throughout the country is one of considerable interest; but whilst of interest it is also of such importance, alike to the sportsman, the zoologist and the public generally, for the civilised community has set its face against any further extinction, in as far as lays within its power to prevent it, of any of the species at present inhabiting the globe, that its consideration in these pages needs no apology.

PRESENT POSITION IN THE NILGIRIS.

Briefly the position in the Nilgiris is as follows :—The Todas have, from time immemorial, annually fired the grazing grounds of the plateau during the hot weather in order to obtain a crop of fine young grass with the first rains. Apparently as long ago as 1879 the then Commissioner framed rules rendering this practice illegal, but the rules have remained in abeyance until within the last year or so, when they were enforced. This resulted in a petition from the Todas to the Collector, stating

that the prohibition was having a disastrous effect upon their cattle. The matter was then gone thoroughly into, and in order that all parties should have a hearing the District Forest Officer, in his note to the Collector on the subject, suggested that the "Nilgiri Game Association" should be requested to give their views on the question. This suggestion was supported by the Board, and the views thus obtained are of sufficient interest to warrant their further consideration.

IMMEMORIAL CUSTOM OF FIRING GRAZING LANDS IN OTHER PARTS
OF INDIA.

As is well known, this firing of grazing areas has been the immemorial custom all over the country, one might almost say throughout the world, wherever the wealth of a community has chiefly reposed in its herds of cattle.

PROHIBITION OF FIRING IN FOREST RESERVES AND OTHER PROTECTED
AREAS.

It has become fully recognised that the custom could not be allowed to continue in the great timber reserves of the country nor in those reserves which were required to be kept in trust to supply the daily wants in fuel, grazing and minor produce generally, of the adjacent communities. In these latter all other considerations must necessarily be subordinated to the endeavour to keep the forests in such a condition as shall insure their being able to give a permanent supply of the materials required in the daily life of the neighbouring inhabitants. Firing of all such areas has, in most parts of the country, been strictly prohibited under severe penal laws, enacted entirely in the interests of the community at large. These village reserves, as they may be styled, may or may not be under the Forest Department. In the latter case they may or may not be under fire protection. Excluding the fire protected areas it may be taken as an accepted fact that all other areas occupied by, or in the neighbourhood of, grazing communities are annually burnt. In this latter category may therefore be included—

(1) The not inconsiderable area of boundary lines, interior fire traces, &c., annually burnt by the Forest Department or Civil

authorities as a protective measure to safeguard the fire protected forests.

(2) The large areas of grass savannahs (called by various names in different parts of the country) annually burnt by the Department with the same object in view.

(3) The annual firing of the majority of non-fire-protected forests and waste lands.

(4) The annual firing (and it may be given a separate heading owing to its vast importance on the question under consideration) of forest and waste lands in the vast majority of the Native States in the country.

RESULT OF THIS FIRING ON THE GRASS.

Now, what is the result of this firing upon the grass? We see in the papers before us that it is held that the grass steadily deteriorates owing to the finer species being killed by the fire and to the manure in the ash being washed away with the first heavy rain! We have read this statement with surprise! Consider for a moment the miles of forest boundary lines burnt every year. Are they not the nightly resort of the herbivorous animals of the adjacent heavy forest and are not the animals seen feeding upon them in the pink of condition and plumpness? Again, the burnt savannahs become full of game as soon as the young grass springs up. In Eastern Bengal the sann (thatching) grass areas are annually burnt over after the grass has been cut with the object of keeping down the growth of the coarser noxious grasses, and thus of obtaining a thick crop of the finer and more valuable thatching grass. Turning to the evidence of the members of the "Nilgiri Game Association," all long residents on the plateau, we see that there is a consensus of opinion against the statement that the grass deteriorates by being burnt. The reasons given by Sir Frederick Price, one of the members, may be taken as the generally expressed opinion of the Game Association on this point—"As regards the theory that burning destroys all the better classes of grass, and leaves only the coarser kinds, it is to be observed—if this is actually the case—that that which is left agrees remarkably well with the Toda buffalo,

whilst that which he gets now evidently does not. I think too much has been made of the point that the manurial constituents of the ashes of the burnt grass are washed away by rain and lost. The principal ingredient of these is potash—a very soluble salt. The rain which comes after the burning has taken place—I speak of this part of the hills including the Kundahs—consists of brief and not really heavy showers, and the surface of the ground after a fire is not smooth. The dry earth drinks the water very rapidly, and very little of the constituents are carried away from the actual spot on which they lie....If this is not so, how comes it that after the grass has been burnt for a series of years beyond the memory of man, burning it still produces at the present time an abundant crop of sweet and green grass? That it does so is beyond denial.

Sir Frederick also alluded to the fact that the annual burning destroys a vast number of insects, such as hairy caterpillars and—that curse of agriculturists—the cockchafer beetle. The latter is to be found egg-laying in the earth at the roots of the grass during the burning season, and thus enormous numbers of beetles, and consequently eggs, are annually killed off.

RESULT OF GRASS FIRING ON THE MAINTENANCE OF THE HEAD OF GAME.

The opinion of all who considered the question of the grass burning on the Nilgiri plateau agreed upon the important point as to its effect on the maintenance of the head of game in the area. The new young grass attracted sambhar and other herbivorous animals to the plateau, and excellent sport was to be obtained as long as the annual burning took place. This of course is the common experience elsewhere in India. The broad fire lines, such as the 100—200 foot lines of the United Provinces Reserves, the burnt over tappas and savannahs, the waste lands all over the country are all haunted by game as soon as the young grass begins to shoot up. The same rule applies to the large areas of grazing grounds in the neighbourhood of big reserves and to the annually burnt over village forests. That this is so is of course fully well known to all Forest Officers who are at the same time sportsmen, and in the interests of the maintenance of the head of game in a district, and

more especially in a heavily shot-over district, they would be the first to advocate the burning of all grass areas where the burning did not actually involve the fire getting into fire protected forests.

THE EFFECT OF THE PROHIBITION OF GRASS BURNING ON THE
GAME IN THE NILGIRI PLATEAU AND ELSEWHERE.

The effect upon the head of game on the Nilgiri plateau after the prohibition of the grass firing was enforced became most marked. The Forest Officer alludes to the fact that all the herbivorous animals left the plateau and sought the slopes of the hills which were still burnt over, and where they could therefore find the new young grass coming up after the first rains. This observation is borne out by the members of the "Nilgiri Game Association," who were asked to report on the subject, and by numerous other sportsmen, who have recorded it as an observed fact. It was pointed out that as a result of the two years' non-firing of the grass only seven sambhar head had been set up by the local taxidermist instead of the 25—30 in years past, and further that the deer having left the plateau to go in search of the grass on the lower burnt-over slopes had been killed off in large numbers by the jungly tribes, who all possessed guns, and that consequently the years of good work of the Association had been destroyed.

That sambhar, bison, and other herbivora will not remain in areas where they have been accustomed to find in the neighbourhood burnt-over grass tracts, once fire protection has been introduced on a large scale, is well known to sportsmen, and we should think to most Forest Officers, all over India. The quotation which heads these lines is from the pen of a well-known sportsman and Forest Officer, and the hills he was writing of are in the Central Provinces, famed for its fine shooting grounds. Will they remain so in the future?

A RESULT TO BE EXPECTED FROM A DECREASE OF THE HERBIVORA.

There is another reason, and a most important one, why it is almost essential that a certain head of herbivorous game should be kept up in the country. We allude to the presence of the larger

carnivora, who for the most part derive their sustenance from this source. The decrease in the head of herbivorous game in an area must almost of necessity be followed by a large increase in the mortality amongst the cattle of that district, and perhaps not alone amongst cattle but also amongst human life. A tiger will not usually take to cattle killing if he lives in an area where the procuring of a fat young buck is a matter of comparative ease. We write 'usually,' for the tiger's habits in this respect are very variable. It may be taken as certain however that tigers and the lesser carnivora will go to the village herds as soon as any difficulty is experienced in obtaining their more natural prey in the forest. It would, we believe, be by no means difficult to obtain statistics to show that a decrease in the herbivorous game of a district had been followed by a heavy increase in the mortality amongst the cattle of the village communities.

POWER OF THE FOREST OFFICER TO PROTECT THE HEAD OF GAME.

That the first duty of the Forest Officer must be to conserve, in the interests of the community, the protected reserves from fire, even when this means sacrificing the head of game, admits of no criticism and needs no insistence upon in these columns. But we think that it equally falls within the province of his duties to maintain as far as in him lies the head of game in the district in which he serves, and to ever keep before his eyes all available means of carrying out this laudable object. From the very nature of his work he is in the best position for obtaining reports and making himself acquainted with what this head of game roughly is and whether decreasing or increasing. We believe the day will dawn when the Forest Officer will be in a position to keep rough game registers in his office having this object in view, and such registers will be maintained not solely in the interests of the sportsman but equally for the advancement of the zoological knowledge of his district, and *ipso facto* of India as a whole, the habits of much of the game in which are but imperfectly understood.



♀

Flowers



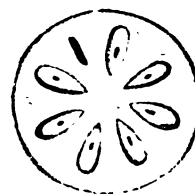
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Section of Flowers



Fruit



Section of Fruit

SCIENTIFIC PAPERS.

A NEW SPECIES OF DIOSPYROS.

DIOSPYROS KANJILALI, DUTHIE.

Diospyros Kanjilali, n. sp.—A small or medium-sized tree with a fairly long trunk. *Bark* greenish or ashy-grey and quite smooth like that of the *guava*, exfoliating in thin scales. *Branches* forming a rather narrow and open crown, not spinescent. *Leaves* $1\frac{1}{2}$ — $5\frac{1}{2}$ inches long, elliptic to suborbicular, thicker than those of *D. cordifolia*, usually densely tomentose when young, becoming rigidly coriaceous and almost glabrous in age; midrib impressed above, prominent beneath, petioles $\frac{1}{4}$ — $\frac{1}{2}$ inch. MALE flowers in short 3-flowered cymes, pedicels $\frac{1}{8}$ inch; bracts ovate, subacute, ciliate on the margins. *Calyx-lobes* broad and rounded, pubescent on both sides and with ciliate margins. *Corolla* $\frac{2}{10}$ — $\frac{3}{10}$ inch long, slightly pubescent outside, glabrous within, pale-green. *Stamens* 16, in opposite pairs, united below; anthers awned, glabrous. FEMALE flowers axillary, solitary, nodding, pedicels about $\frac{1}{4}$ inch. *Calyx* (in fruit) accrescent; lobes spreading, broader than in *D. cordifolia*. *Corolla* dark-green, otherwise like that of male. *Staminodes* 8, alternately longer, the longer ones often toothed near the acuminate apex, the shorter ones obtuse. *Fruit* up to 1 inch in diameter, globose. *Seeds* about $\frac{1}{4}$ inch long, somewhat curved.*

Recorded by Kanjilal from Kalsi, Rajpur, Lachiwala and Thanu in Dehra Dun, and from Ranipur, Dholkhand and Badshahibagh on the Siwalik range. It flowers during April and May. Other localities are—Chanda district of the Central Provinces,

* I am indebted to my friend Mr. Gamble for the following description of the wood of this species :—

Wood brownish-grey, with occasional iron-grey streaks, soft to moderately hard, no heartwood.

Pores small, very scanty, in radial groups 1—3, which are distant between the medullary rays and faintly in échelon. *Medull of rays* numerous, very fine. Transverse lines very faint.

O 4952. Dehra Dun 50 lbs.

Duthie No. 9559, N. Kanara, Ritchie No. 972. Mr. Gamble has also collected it in the following localities :—Santal Parganas in Bengal No. 10614, also in the Madras districts of Ganjam No. 13657, Anantapur No. 20873, Bellary No. 16583.

This tree has already been alluded to by Kanjilal on p. 221 of his "Forest Flora," where he remarks—

"There is a tree occasionally met with in the Saharanpur and Dun Divisions * * * which differs from the *montana** as described above in the following respects :—*Trunk* fairly long ; *crown* rather narrow and open ; *branchlets* not spinescent ; *bark* greenish-grey, always smooth, exfoliating in thin scales ; *leaves* larger 3—5 by 1½—2 inch, oblong or elliptic, sub-coriaceous, brittle, pubescent or glabrescent, midrib impressed above, prominent beneath * * *."

It appears to occupy a position intermediate between *D. montana* and *D. cordifolia*, agreeing with the former in general habit, stature, smoothness of bark and in the absence of spines but differing by having thick coriaceous leaves, the male flowers in threes (not in panicles) and twice the number of staminodes. From *D. cordifolia* it may easily be distinguished by its smooth bark, absence of spines, the shape of the leaves, the glabrous and awned anthers, and by the number of staminodes ; it also differs by having a more defined trunk with ascending, not spreading branches.

Plate xxx shows the leaves, flowers and fruit of this tree.

I have great pleasure in naming this tree after my friend and former pupil Rai Sahib Upendranath Kanjilal, to whom I am much indebted for a complete set of herbarium specimens and for some excellent photographs of the tree taken by himself.

KEW :
24th March 1905.

J. F. DUTHIE.

* This is *D. cordifolia* Roxburgh and not the true *D. montana* of Roxburgh, which is a comparatively rare tree in Northern India. —(J. F. D.)

ORIGINAL ARTICLES.

SOME FACTS ABOUT GUTTA PERCHA.

BY A. M. BURN MURDOCH, I. F. S.

CONSERVATOR OF FORESTS, FEDERATED MALAY STATES.

Gutta percha, derived almost entirely from trees growing within six or seven degrees of the equator, is naturally one of the most important products of the Federated Malay States, of Perak, Selangor, Pahang and Negri Sembilan. I will endeavour in this article to give a general idea of the subject, under the following heads :—

- I.—General, species, distribution, etc.
- II.—Measures taken for protection, past and present.
- III.—Methods of extraction.
- IV.—Manufacture, adulteration, lines of transit.
- V.—Properties.

I.—GENERAL, ETC.

The word *gutta percha* is derived from the Malay word "Getah," which means any substance, such as gum, latex, resin, etc., which exudes from wounds or incisions in the bark of trees. "Percha" refers to the Malay name for Sumatra, "Pulau percha." *Gutta percha* therefore originally meant Getah from Sumatra.

Gutta percha in its pure state may be taken to mean the coagulated latex of trees belonging to the genera *Palaquium*, *Syn* (*Dichopsis*, *Isonandra*) and *Payena*. Inferior *gutta perchas* are yielded also by several species of *Bassia*, and one or two species of *Ficus*, but these will not be discussed here, the object of this article being to consider the best *gutta percha* producing species, namely, those above mentioned, which are also the ones found in the Federated Malay States.

Mr. Curtis, in the "Agricultural Bulletin of the Federated Malay States and Straits Settlements," has made the following observations :—" *Palaquium*, the tree referred to as 'Getah taban,' was

originally described as an *Isonandra*, but subsequently found not to agree in certain particulars with that genus, consequently a new genus was created, called *Dichopsis*. Later it was found that the characters of *Dichopsis* were identical with those of *Palaquium*, which, being of older date, takes precedence under botanical etiquette." The best gutta percha is yielded by a tree known as "Getah taban" in these States, of which there are several varieties—*e. g.*, Taban merah—*Palaquium oblongifolium* or gutta.

Taban chaier—*Palaquium* sp.?

Taban puteh—*P. pustulatum*.

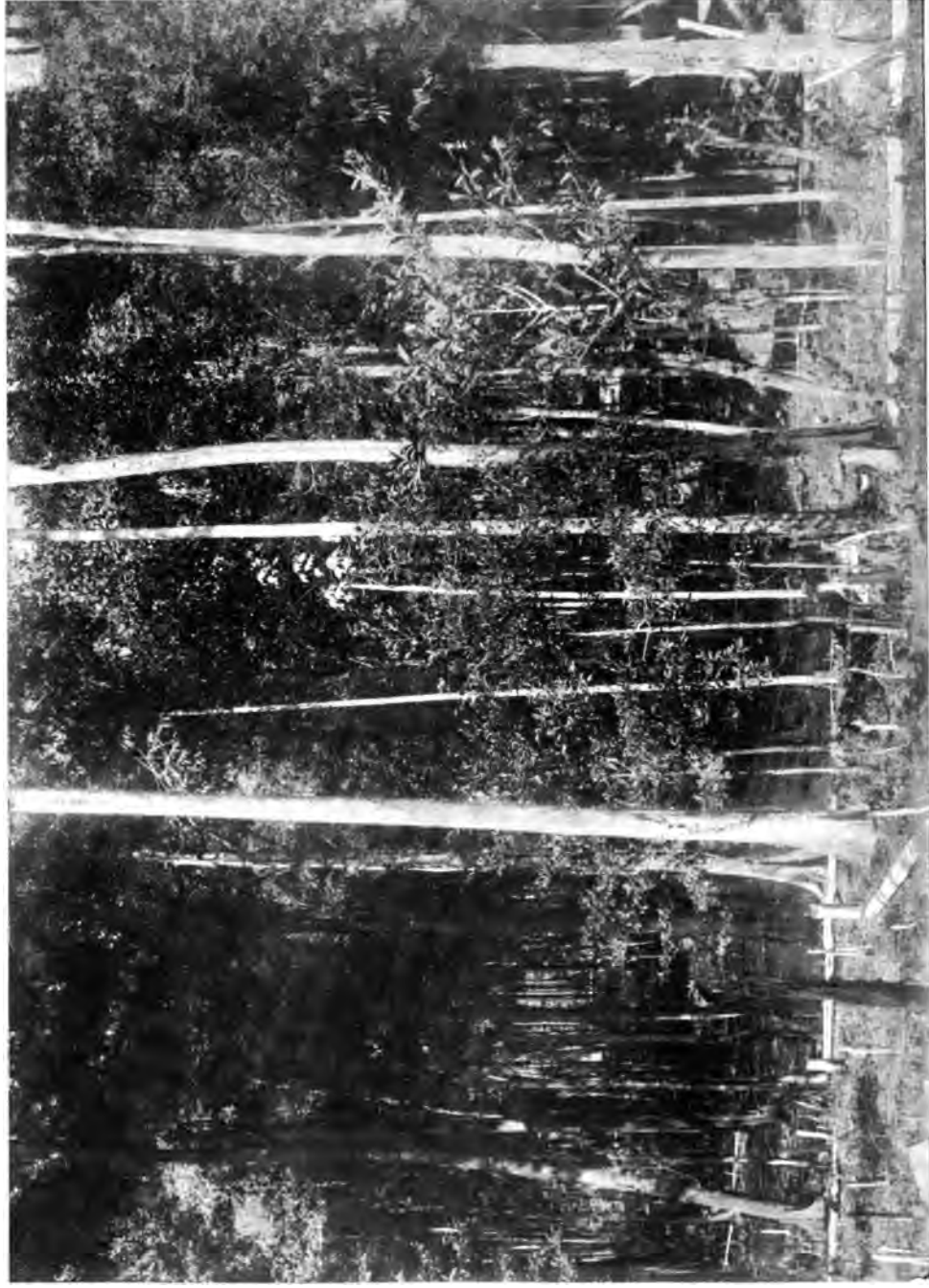
Taban baik—*P. sp.*?

Getah sundik—*Payena Laerii*.

All these are good except Taban puteh, which is much inferior to the others. Considerable doubt exists amongst botanists as regards the specific names of numbers 2, 3, and 4, and *P. oblongifolium* and *P. gutta* are by some considered as distinct species. Local names cannot be depended on at all, as they differ in the different States. *Payena* is not found in anything like such quantities as *Palaquium*, and it is chiefly with the latter that I propose to deal.

Palaquium gutta is found in all four States, the best areas lying between 2 degrees and 5 degrees north. It must be considered as a dominant species, but exists at present, owing to the unregulated and wholesale fellings by natives some years ago, only in the seedling and small pole stage.

It occurs most frequently on the low hills and plains, often on steep hill sides, and up to 2,000 feet above sea level, and even 3,000. It is found well represented in large blocks of forest, varying in size from a few hundred acres to 10,000 or 15,000 acres in extent, while it may be practically absent in other areas for long distances. On close examination a great many of the young plants are found to be stool shoots, but there are many seedlings also, although seed trees are not now to be found. This looks as if the felling of mature trees did not cease till comparatively recently. The "Taban" tree is a shade bearer of the most pronounced description, and is able to maintain the struggle for existence successfully, if



H. C. Robinson, Photo.

Palaquium gutta high forest showing the stems of a group of seedlings and small poles beneath,
(Federated Malay States).

slowly, in these dense evergreen forests. It grows to a considerable size ; the largest I have actual knowledge of in this country was in Penang, and measured when blown down 52 feet in height and 42 inches in circumference at 14 feet from the ground. I have seen mention of a tree 140 feet high in the Philippines, and there is no doubt that it is an exceedingly slow grower. At present poles 30 to 40 feet high are fairly common in these States, but large trees are rarities. In the Straits Settlements Palaquium only exists in the natural state to a very small extent, *e. g.*, in Malacca near Nyalas, not to mention a few scattered trees in Penang and elsewhere. We must rely in the Colony on our plantations or on the Federated Malay States, where large areas are found containing this plant in the wild state. At present a small plantation exists at Batu ferringi in Penang and another in Malacca and Singapore. The *P. gutta* tree is very easily recognised by its leaves, which are coriaceous, oblong or obovate-oblong and obtusely acuminate ; in colour they are of a beautiful coppery gold colour on the under surface, and dark glossy green on the upper. In a mature tree the leaves are about two inches long, but much longer in the young plant. In the forests this tree appears to be very free from the attacks of disease, the only one I have seen being in plantations, and caused by the larva of a moth which I believe to be a species of *Rhodoneura*.* This larva eats the young shoots and leaves, and has done appreciable damage in Malacca.

II.—MEASURES OF PROTECTION.

The qualities of gutta percha became known about 1845, and the demand steadily increased from that time, till in the seventies there was a rush for it by the natives of these States, the price rising rapidly till 1902. Between 1895 and 1900 the exports from Singapore rose from 2,642 tons to 5,831 tons. It may safely be said that from 1890 onwards the natives of these States were doing their best to obtain gutta percha. Their method of extraction consisted in felling every tree they came across and extracting the

* *Rhodoneura myrsusatis*, Wlk.

latex in a wasteful, rough and ready manner, so that by the time the authorities awoke to the fact that Palaquium was being exterminated (about 1898), it was too late to save trees large enough to produce gutta percha. It is difficult to see how this could have been prevented, however, as at the time there was no properly organised Forest Department, and whatever measures might have been adopted it would have been impossible to effectively carry out in these dense, unpopulated, evergreen forests.

In Perak the export of gutta percha was prohibited in 1881, but allowed again in 1887, the issue of passes to collect being prohibited in 1900. The first timber rules, published in 1898 by the British Residents of the various States, contained the initial protective measures, which were to the effect that no rubber-bearing tree should be felled if of less than 8 inches diameter. This rule could not, I imagine, be enforced in practice, owing to the want of an organised staff. In 1899 and 1900 the matter was taken up by the High Commissioner and the Resident-General, and in the latter year the British Resident, Pahang, issued orders to all his officers to do all that lay in their power to prevent the destruction of gutta percha producing trees.

The question of planting was also discussed, but not in a very practical manner.

The Forest Department was started in each State by the appointment of a local man, in Perak in 1895, in Selangor in 1898, in Negri Sembilan in 1899, and in Pahang not till 1902, when a member of the Indian Provincial Forest Service was sent over on deputation at my request, I having been deputed from India in October 1901 as Conservator of Forests.

Early in 1902 I suggested that an export duty of 80 per cent *ad valorem* be imposed on all gutta percha leaving these States, as a means of putting a stop to the extraction and collection of this product, a considerable period of absolute rest being obviously indicated for all gutta percha producing trees.

The rules were also amended and the felling of trees for the extraction of the latex was prohibited. In addition to these precautions departmental instructions were issued to the effect that



H. C. Robinson, Photo.

**High Forest of *Palaquium gutta* with seedlings and poles beneath, all naturally grown.
(Federated Malay States).**

no licenses for the extraction of gutta percha were to be issued. At the present time therefore it must be difficult to collect gutta percha and export it in sufficient quantities to make it pay. That a certain amount of smuggling goes on I have no doubt, from the fact that two or three cases have come to light in which Chinamen were found in possession of small quantities and were convicted of the offence. Since 1902 the staff of the Forest Department has been greatly increased, and I have reason to believe that the Government have done and are now doing all that is in their power to assist in the preservation of this valuable product.

As regards measures for protection from other causes of destruction, such as alienation of land for mining and agriculture, the only plan is to reserve all the valuable Palaquium areas, constituting them forest reserves wherever possible, without interfering with valuable tin-bearing land. We already have an area of about 60,000 acres reserved, fairly rich in young "Palaquium," chiefly in Perak and Selangor, and probably as much more remains to be taken up in Pahang and elsewhere.

Again, before any large area of land is alienated the department is referred to, and if alienation takes place in spite of the presence of Palaquium, we are given the opportunity of taking away the young plants and transplanting them into reserved areas. In the course of time, when all forest reservation has reached its natural limit, Palaquium is bound to disappear from all tracts outside, nor does this matter, as it is only practically possible to watch defined areas when placed completely under the control of the Forest Department.

The systematic exploitation of the gutta percha areas will only be possible in reserved forests, tracts being taken in hand annually.

(c) Regeneration.

The natural regeneration of "Palaquium," as already stated, is very good, but growth is slow and assistance must be given. Our object now is to encourage only the best species, *P. oblongifolium* and gutta. Regular plantations, *i. e.*, planting in cleared

areas from seed, is at present impossible in these States, as no seed is available. The method followed by the Forest Department here is to cut lines through the dense undergrowth in the forest reserves, taking up regular areas in turn, and to transplant into these lines young *Palaquium* seedlings taken from outside the reserve in forests that cannot for various causes be protected, or taken from groups inside the reserve where they are growing too close together. At the present time we have an area of more than 1,000 acres so planted in Selangor.

In the Trollah reserve in Perak *Palaquium* seedlings are so numerous in the seedling and pole stage that planting over a considerable area is unnecessary. Here we resort only to improvement fellings, transplanting young plants into blanks only wherever necessary. The improvement fellings consist in clearing away undergrowth interfering with young *Palaquium* plants, the operation being repeated yearly or once in several years, as may be necessary. By this means the rate of growth of the young trees is greatly increased. I have found the effect of this process to be very beneficial even in the two years since it was started. By such simple methods as these it is hoped in a few years to have a very considerable area of young *Palaquium* trees about 40 to the acre. One advantage in this system is the freedom from the attacks of insects to which trees grown in pure plantations are liable. A similar area to that in Selangor exists in Malacca, but the plants are put in closer together and were obtained from Sumatra. Similar plantations exist at Bukit timah in Singapore, and at Batu ferringi in Penang, but on a small scale.

III.—METHODS OF EXTRACTION.

The latex of *Palaquium* exudes immediately on tapping, *i.e.*, cutting the bark, and consists of a milky-looking white fluid, which, in young trees, is rather thin. It coagulates very quickly and turns in the case of "*Taban merah*," *P. gutta*, a light pink colour when hard. This is doubtless due chiefly to the fact that the under side of the bark of this species is reddish, and small pieces of the bark get mixed up with the latex while it is being rolled off. The



H. C. Robinson, Photo.

Natural Palaquium high Forest in Federated Malay States with undergrowth still uncleared.

rapid coagulation and the fact that the tree only bleeds for a very short time from the cut are at the root of the disastrous system of extraction of the latex, *viz.*, by felling the tree, tapping the living tree as with Para rubber, being, it was supposed, impracticable.

The native method is to fell the trees and to cut ring-like incisions round the fallen trunk at intervals of about 9 to 12 inches or even less. These are quickly filled by the latex, and in about half an hour the pure gutta percha can be rolled off on sticks. The product is then boiled and shaped as desired, but many impurities are included, such as chips of wood, bark, dirt, etc.

This process is of course very wasteful, as a good deal of latex falls to the ground; the latex which is contained immediately underneath the cut and touching the ground is also inaccessible. Again, the gutta percha contained in the leaves and remaining bark and in the twigs is not collected, and, as will be seen later on, this is a very considerable amount.

The same method is applied to Getah sundik, *Payena laerii*, which produces a very white gutta percha.

Dr. Sherman, in the Philippines, estimated that only $1/35$ of the total quantity contained was extracted by natives, and from other experiments it is said to be certain that not more than $1/10$ is obtained.

In Penang in 1900 a tree was felled 39 inches in circumference at 5 feet from the ground, with a height of 55 feet, height to the first branch being 35 feet. This tree was thought to be about 50 years old. The gutta percha was extracted by the above mentioned native method under the personal supervision of the Superintendent of the Botanic Gardens, and yielded only $1\frac{1}{2}$ lbs. of gutta percha. Another tree blown down in 1901, 52 feet high and 42 inches in circumference, yielded by the same method $1\frac{1}{3}$ lbs. only. Dr. Sherman had a tree felled in the Philippines 160 feet in height and 8 feet in circumference which yielded only $8\frac{1}{2}$ lbs., whereas he estimated that could all the latex in the leaves and bark have been obtained he would have extracted 150 to 200 lbs.

Other methods of extraction have been tried, *e.g.*, from the leaves and bark. The green leaves of the best species of *Palaquium* contain up to 3 per cent of pure gutta percha and the bark about 5 per cent. A company was started in Singapore which, by simple mechanical means, extracted gutta percha from them, but I believe that great difficulty was met with in the procuring of sufficient leaves. I believe this method of extraction could be employed by the Native States were the necessary plant set up close to the forest. Extraction can also be effected from dried leaves by this method, but there is great loss through oxidisation while drying gradually.

There are also various methods of extraction of the latex by chemical means, but I believe I am right in saying that these are less satisfactory as regards the produced gutta percha. I am very doubtful whether extraction from the leaves only, *i. e.*, from leaves gathered from standing trees without tapping the tree, would be a success from an economical point of view. From what we know, the best method would seem to be to fell the tree, but to extract every ounce of latex from the bark, twigs, and leaves of the felled tree. This would not present any great difficulties. In any case it is obvious that the method of collection from leaves only is a most dangerous one if carried out by natives as they cut down the young saplings in order to reach the leaves, otherwise inaccessible without great trouble, whereas were they collecting by their own methods it would not pay to fell trees of less than a certain size. Again, *Palaquium* appears to be a very slow growing tree and what effect the stripping of some or all of the leaves, even at considerable intervals, would have is very uncertain. So far the Forest Department in the Federated Malay States has not concerned itself greatly with methods of extraction; all its energies must for the present be devoted to the protection and cultivation of the trees. There is ample time in which to make experiments. Lately some fairly large trees have been found in the forests, and I intend, before long, to make experiments in tapping the living trees; it is quite possible that, by tapping the tree from the base upwards to a considerable height, a good quantity

of latex may be obtained without seriously affecting the vigour of the tree. Of this, however, I have no great hopes, as I have heard that tapping as hitherto attempted has had an injurious effect.

I may here mention that from the leaves of *P. pustulata* which I sent to Singapore but very little gutta percha could be extracted; in fact, practically none at all. From *P. gutta*, however, over two per cent was obtained, but I am informed that the gutta percha so obtained is not of the first quality and will not do for cables.

IV.—MANUFACTURE AND TRANSIT.

According to M. Collet, who published a pamphlet on the subject, nearly all the gutta percha of commerce goes to Singapore, where it passes through the hands of Chinese middlemen, the cleverest adulterators in the world. To such an extent has adulteration been carried on that the finished article they turn out resembles but slightly pure gutta percha as taken from the tree, and he adds "it is impossible to determine the origin of the gutta percha as comprising the *reboiled* of Singapore." This is greatly to be regretted, and I feel sure that the present enormous fall in price is partly accounted for by the adulteration to which this product has been subjected. As will be seen further on, the prices lately quoted in Singapore for gutta percha are less than those current for very ordinary India rubber of low grade. It is a well known fact that the exports of gutta percha from Singapore greatly exceed the imports. This is, however, partly explained by the fact that very inferior "Getahs" such as "Jelutong" (*Dyera costulata*) are shown when imported as inferior India rubbers, and then mixed with gutta percha and exported as such. "Jelutong" can hardly be called a gutta percha however, and this only bears out my statement. Whereas the price of gutta percha rose in 1902 to \$500 per pikul (1 pikul = 133 $\frac{1}{3}$ lbs.) the average price of Getah Jelutong is only \$6.50 cents. Gutta percha also finds its way into Singapore under the name of India rubber; also a certain amount is brought in by passengers and smuggled through in small quantities at a time.

V.—PROPERTIES OF GUTTA PERCHA.

As is generally known, pure gutta percha when heated becomes soft, malleable and plastic, but when allowed to cool it becomes hard, retaining any shape given it when hot. Pure gutta percha is so hard that it would be difficult to drive a nail into it when in the cool state. In composition it differs from India rubber physically more than chemically. It burns freely with a very characteristic odour. When exposed to air for any length of time it oxidises, when its insulating qualities and durability decrease, but if kept in water its duration is indefinite.

Acids do not affect it unless concentrated.

Its chief value of course arises from the fact that it is unaffected by sea water ; this and its insulating qualities make it invaluable for submarine cables.

The chemical composition according to W. P. Brant is as follows :—

Carbon	86.36
Hydrogen	12.15
Oxygen	1.49
<hr/>	
	100.00
<hr/>	

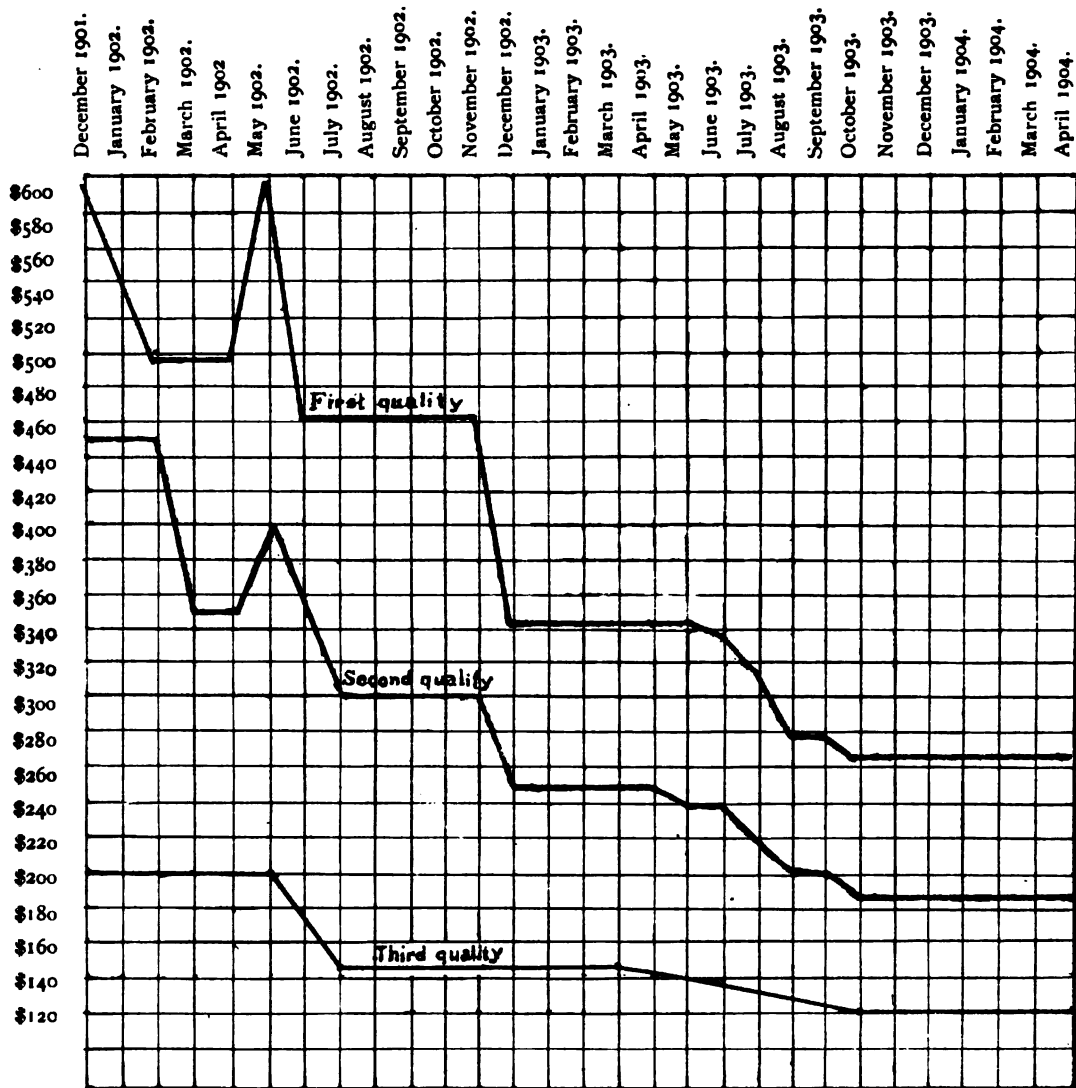
Its physical composition according to Payena—

Gutta	78.82
Albane	16.14 (crystalline resin)
Thiarite	5.04
<hr/>	
	100.00
<hr/>	

It is a great pity that in Singapore and in the Malay States generally the term “gutta” is used indiscriminately to mean either India rubber or gutta percha, as this leads to great inaccuracy in returns.

SOME FACTS ABOUT THE TRADE.

In 1880 Great Britain imported from the Straits Settlements 68,862 cwt. of gutta percha valued at £505,821, while in 1876



NOTE.—The difference in price between the three qualities is much smaller in April 1904 than in December 1901, when prices were high. This appears to me an indication of deterioration of 1st and 2nd quality.

the imports were only 19,665 cwt., and in 1878 49,387 cwt. Thus it would seem that the rush for this product came on between 1876 and 1880, or within the last 28 years. In 1890 the price was 316 per pound, but rose to \$4.60 cents in 1902.

The exports from Singapore for the last 18 years are as follows :—

1886	Pikuls	33,946.	1895	Pikuls	43,910.
1887	"	25,539.	1896	"	43,769.
1888	"	23,717.	1897	"	45,417.
1889	"	59,493.	1898	"	93,398.
1890	"	78,930.	1899	"	78,343.
1891	"	54,026.	1900	"	97,399.
1892	"	41,990.	1901	"	73,815.
1893	"	38,045.	1902	"	63,559.
1894	"	42,841.	1903	"	35,661.

The question which naturally forces itself on one's mind is, will there be any demand for gutta percha by the time the Federated Malay States forests have been given time to recuperate? A substitute may be invented or submarine cables may become unnecessary ; either of these two contingencies failing, it is difficult to see why the demand should not be even greater than heretofore. In this case it will be advisable for the Government to transmit its gutta percha direct to agents or manufacturers at home, and above all not to send it to Singapore to be changed beyond all recognition by the Chinese middlemen. Appended is a statement of the highest prices of three qualities of gutta percha exported from Singapore during its zenith and decline. I am told that this decline of first quality is largely due to the falling off of the demand for the best quality owing to the cessation at present of work on laying cables, but do not think this the only cause.

For the photographs here reproduced I am indebted to Mr. H. C. Robinson of the Selangor Museum. They represent a forest in which the dense undergrowth has been cleared, showing up the young *Palaquium* plants, those with the rather stiff looking leaves. In Plate xxviii the tall sapling in the centre is a *Palaquium gutta*, also the one close to it.

Plate xxx shows a group of seedlings and small poles under the big forest.

Plate xxxi the same ; these are all naturally grown. It is difficult to obtain good photographs owing to the bad light.

Plate xxxii shows some forest not yet cleared of undergrowth ; the tree with the white light on the stem is a Palaquium.

HERBERT SLADE, O. U. S. E.

On the 12th March last Mr. H. Slade, Conservator of Forests, died suddenly of cholera at Akyab, to the great regret of all who knew him.

Slade was educated at the Nancy Forest School, and joined the Department in Burma in December 1882. After serving for a few years in Lower (then British) Burma he was sent, after the annexation of Upper Burma, to the new Province and placed in charge of the Chindwin Division, an immense area containing some of the richest teak forests in Burma. After some years of arduous work in the Chindwin, his services were again claimed by Lower Burma, and he was, until his departure for Siam, in charge of the Tharrawaddy Division.

In 1896 he was deputed to Siam to form a Forest Department there. In the face of great opposition—even from quarters whence he had a right to expect help—he succeeded in putting a stop to the old, strongly-ingrained, illicit methods, in establishing the proprietary right of the Crown to its forests and in setting up a properly constructed Forest Department. This was a grand performance, yet Slade left Siam greatly disheartened at his failure to get through certain measures, which were, however, afterwards recognised to be necessary. In 1899 he received the Third Class of the Order of the White Elephant of Siam.

Since his return to Burma in 1901 he had been in charge of the Pegu and Northern Circles. At the time of his death he had just relinquished charge of the latter Circle, and had proceeded to Arracan on special duty to organise forest work in that Division.

Slade was of the best type of Englishman—absolutely simple and straightforward. He was honoured and respected by every officer who had the pleasure of serving under him. He was in fact always most popular through the great charm of his character. While the State has lost a strong and capable officer we who knew him have lost even more—a dear friend.

The Lieutenant-Governor of Burma recorded his appreciation of Slade's services in the following notification published in the *Burma Gazette* :—

The Lieutenant-Governor has heard with deep regret of the death at Akyab on the 12th instant of Mr. H. Slade, Conservator of Forests. Mr. Slade, who joined the Forest Department in Burma in 1882, was an officer of unusual knowledge and ability, whose services have been of great value to the Local Government. From 1896 to 1901 he was employed in Siam, where his successful administration of the forests was rewarded by the grant of the Third Class of the Order of the White Elephant. By his untimely death the Government have lost one of their most capable and devoted servants.

THE GRAZING QUESTION IN MADRAS.

BY F. A. L.

The future of the forests depends so much on the amount of grazing that they can be saved from, while the present of the ryot depends (or is said to depend) so much on the number of cattle which he can maintain at a nominal cost, that it appears impossible to reconcile these two divergent interests. The interests of the cultivator are rightly considered of paramount importance, and it is impossible to convince the ordinary ryot that grazing restrictions, necessary from a forest point of view, are advantageous to him. For generations he has been accustomed to keeping as many cattle as he could find food or water for, not for tilling his land, but as the cheapest and most convenient method of bringing produce from the forests and depositing it in the form of manure on his land. In what may be called, so far as forestry is concerned

the prehistoric days prior to the introduction of the Forest Act, certain areas were selected as reserves; these areas were theoretically closed to man and beast, and it was probably for this reason that an order was issued to the effect that no reserve should include any public path. Consequently the reserves were very limited in area, and as free grazing was allowed everywhere except in the reserves, their formation did not materially diminish the area available for cattle of all descriptions. But with the reorganisation of 1882 and the introduction of the Forest Act, reserves were soon formed on a large scale, and the old idea of the word "reserve" being synonymous with "area rigidly closed to man and beast" had to be modified. In 1885 Mr. Gamble advocated light grazing in the Nilgiri reserves, and in the same year Colonel Campbell Walker declared himself in favour of light grazing in the forests of the plains, defining "light" as one head of cattle per five acres of forest after excluding all bare and rocky patches. Various proposals for limiting the number of cattle to be admitted to a reserve were made, but they all failed, those on the "first come first served" principle because local cattle-owners might be excluded from a reserve by the prior advent of an exotic cattle breeder with a large herd, and those on the villageman distribution principle because of the impossibility of effecting an equable distribution by the forest staff then available or by village officers. It was then decided that no restriction on the number of cattle to be admitted to the reserves could be attempted, and grazing permits for which nominal fees were charged were issued to all-comers. At first these permits held good for all the reserves of the district in which they were issued, and in the hot weather as soon as the pasture in one reserve was exhausted, by overgrazing or by fire, the cattle were moved on to the next reserve irrespective of the number of cattle it might already contain. The results, in a bad dry season, may easily be imagined; half-starved cattle from a reserve which had been cleaned out of fodder or water crowded into the nearest reserve and accelerated the disappearance of the available fodder therein, after which, augmented by the cattle which habitually grazed there, they moved on to overcrowd a third reserve, and so

on, till they reached a tract of forestless country which they were too feeble to cross, and there they died by the hundred.

In order to prevent this reoccurring and to ensure a certain distribution of cattle, the area for which permits held good was reduced ; the unit of area became part of a reserve, a reserve, or a group of reserves according to circumstances, but still no restrictions on the number of cattle to be admitted to each unit were imposed. If a cattle-owner wished to transfer his cattle from one grazing block to another, he had to pay for new permits for the second block, and though the grazing fee was and is quite nominal (three annas per cow per annum) this double payment gave rise to numerous petitions. It has no doubt augmented the grazing revenue in many districts, but the cattle-owner considers it an injustice and has good arguments on his side. Owing to the absence of all restrictions on the number of cattle admitted to each block, certain favourite blocks soon get overcrowded with local cattle to which in the dry season are added herds of breeder's cattle ; fodder or water or both fail, and the cattle-owners who have paid for grazing for a year demand that they may be allowed to move their cattle without further payment to a block which contains fodder. I use the word *fodder* instead of *pasture* advisedly, for in many of the reserves in the plains, after the disappearance of all pasture, cattle are fed on the leaves of trees, cowherds lopping off branches freely, and at the end of the hot weather these overgrazed reserves present a pitiable spectacle : ground as hard as iron and as bare as a rock, not a leaf or a green shoot within six feet of the ground, trees barked and lopped in all directions ; no wonder that natural reproduction hardly exists in the reserves, and as for the unreserved lands they are past praying for. From the moment that payment was demanded for grazing in reserves, the pressure on unreserved lands increased ; no man would care to pay three annas on the chance of getting grass in a reserve so long as he could keep his cattle alive on the unreserved lands, but as the area of reserves increased the free grazing area diminished and also the free felling area, with the result that the denudation of unreserved lands was enormously accelerated, and most of them are now

useless for pasture except during the monsoon months. Goats of course were the principal factors in the work of denudation and destruction, and in some districts their depredations are still allowed even in reserved forests because the ryots say that goats are necessary to agriculture; in other districts, however, the imposition of a grazing fee of from eight to twelve annas a goat has resulted in the disappearance of a large proportion of the herds of goats formerly maintained, and it has not been shown that agriculture is any the worse off in consequence. If it is true that "nature abhors a vacuum" it is equally true that "forests abhor goats," and as a well-known French Forest Officer said with reference to the goat question in Algeria, "If anybody will show us how to grow goats and forest on the same area we shall be much obliged, for no Forest Officer has yet succeeded." Goats must sooner or later be relegated to unreserved lands, the denudation of which will limit the number that can be maintained; they should not enter into the question of provision of grazing in reserved forests.

What then will be the future development of the grazing question? If unlimited grazing continues, deterioration and eventual disappearance of the forests must be the result. There is no doubt that unlimited grazing is not the best treatment for the forests; is it the best for the cattle-owner? Under it the local cattle-owner finds the reserves in his vicinity overrun with cattle belonging to breeders; he pays a grazing fee with no certainty of obtaining grass for his cattle; at best his cattle get half rations and deteriorate, and in times of scarcity he loses many that might have been saved if the number of cattle admitted to the reserve had been limited to its grazing capacity. Given a sufficiency of grass his cattle would improve, and so would the forest growth on which he counts for his building and agricultural materials. In fact it is generally admitted that unlimited grazing is an evil, but the difficulty of restricting the number of cattle without hardship to the poorer cattle-owners has hitherto prevented any attempt at limitation. The difficulty is not insurmountable, but requires careful treatment. Firstly, what are the classes of cattle for which

grazing has to be provided? They may be divided into—(1) plough and domestic cattle, (2) cattle kept for the value of their manure, (3) cattle kept for breeding purposes. The country would not suffer materially if class 2 were eliminated; other manures and other means of bringing manures to the fields would soon take the place of these manure collectors, and the quantity of straw and pasture available for use by the remaining two classes or for sale would be so largely increased that fodder famines would become rare. Class 1 has to be provided for locally, and class 3 in the large forests in which local demand falls far short of the supply of pasture. In 1890 the Madras Government outlined a scheme for light grazing and stated that cattle required for agricultural and domestic purposes must have first claim on reserves; that if this were not done the result of protection would simply be a large increase in the number of animals requiring pasture and the consequent failure of all efforts to permanently improve the grazing grounds; it further considered that grazing should be provided for the cattle of every landholder at the rate of two bullocks and one milch cow for every five acres of land occupied. Unfortunately this does not seem to have been brought into force, either from want of establishment, or from want of reserves. It is quite conceivable that an isolated reserve of, say, 1,000 acres extent may be surrounded by villages containing 10,000 acres of occupied lands, and the grazing demand based on the above scheme would amount to 6,000 head of cattle. No scheme for the distribution of grazing can succeed unless it is based on the amount of grazing available. It has been suggested that the grazing fees should be raised until the demand is reduced to the grazing capability of the reserves, but this would entail the exclusion of the poorer classes of ryots in favour of the wealthy landowners and the cattle-breeders. It would, on the other hand, diminish the number of cattle kept for manuring purposes, and this is one of the principal objects to be attained in localities in which the demand for pasture exceeds the supply. In such localities the ryot must learn to substitute other forms of manure, and an increase in the grazing fee would make him seek a different method of enriching his land. It is only the

existence of cattle kept for manuring purposes that necessitates the grazing fee being kept at its present nominal sum ; in some districts higher fees are charged for breeders' cattle, and in most districts plough cattle are stall fed. A gradual increase in the grazing fee might therefore be allowed. But the complaining ryot always excites sympathy by the plea that he cannot afford to pay grazing fees for his agricultural (*i. e.*, plough) cattle, and has been known to make this an excuse for his inability to pay his land assesment ; this of course is no argument against the levy of moderate grazing fees, for if the land assessment is so high that the ryot cannot afford to spend three annas per annum on the maintenance of each bullock required for cultivation purposes, it is evident that the land tax is excessive ; the same argument would apply if instead of three annas the grazing fee was three rupees, which for a yoke of bullocks comes to 3.15 pies per day, a sum considerably below the actual cost of stall feeding. It would, however, be impossible to suddenly raise the grazing fees by any considerable amount and, though a gradual increase in fees will lead to a gradual decrease in the number of cattle, some other means must be adopted to put a stop to the excessive grazing in reserves while at the same time safeguarding the interests of the small and poor landholders. This can best be done by bringing into force, with certain modifications, the Government scheme of 1890.

No grazing block should contain more than one compact block of forest ; it is immaterial whether the block is a reserve, a group of reserves, or a portion of a reserve ; the division of forests into grazing blocks must depend on local circumstances. From every village adjoining a block the Kurnam or village accountant should submit a statement showing the number of landowners holding (1) less than five acres of land, (2) from 5 to 10 acres, (3) from 10 to 15, and so on ; from these statements the grazing demand should be calculated at the rate of two plough cattle and a cow for every five acres, or other unit (the area worked by a yoke of cattle varies enormously in different districts or even in parts of one district) ; the grazing "possibility" of the block should also be calculated, and if the possibility exceeds the demand grazing



permits can be issued to the landowners in proportion to the extent of their holdings ; if, on the contrary, the demand exceeds the possibility, the issue of permits must be limited to the latter, and must be proportionate to the individual demand.

In the first case (possibility exceeds demand) the question arises, what is to be done with the excess grazing available? If, within reasonable distance, there is a grazing block in which the position is reversed, the excess can be allotted to the villages concerned ; in other cases it may be allotted either to manuring cattle or to breeders' cattle, according to circumstances ; if to local manuring cattle the grazing permits might be sold by auction, if to breeders' cattle they might be sold at fixed rates, higher than those charged for plough cattle which are kept low in the interests of agriculture. In the second case (demand exceeds possibility) what is to happen to the cattle for which permits are not issued? Unless other grazing blocks are available in the vicinity it will be a case of the survival of the fittest. The Forest Department cannot give more than it has got ; if there is pasture for 1,000 head, and the demand is for 2,000 head, either the forest or the cattle must go ; now, every acre of forest that goes means decreased pasture, and the result of sacrificing forest to cattle would be that in a few years' time the possibility would be 500 head instead of 1,000. It is evident therefore that in order to maintain the amount of pasture available the excess number of cattle now existing must disappear or be supported in some other manner.

The above scheme provides cheap grazing up to the amount that the forests can support for agricultural cattle and ensures a fair distribution of permits among landholders, and this is as much as Government can be expected to undertake, but what will be the result when the demand for pasture exceeds the supply? By the universal law there must be an increase in the price of the commodity in demand, and as actually most of the plough cattle are stall fed, the permits issued at a low rate for a certain purpose will be sold at a premium to the owners of herds of manuring cattle ; the small land-owner with his one pair of bullocks will get no grazing for them in the reserves (he does not require it!) but will

make a few annas by selling his permits to his rich neighbour, and this will pave the way for a general increase in the grazing fees in a few years' time. If then the eventual result of this scheme, which involves a great deal of work, is the increase of grazing fees, would it not be simpler to go straight to the end and gradually raise the fees? I think not, because the above scheme limits grazing to the possibility of each forest *at once*, whereas the gradual increase of fees would take years to effect the same object, and in the meantime the possibility would be steadily diminishing.

CORRESPONDENCE.

THE TREATMENT OF SAL FORESTS UNDER THE SELECTION SYSTEM.

In the numbers of the *Indian Forester* for September and October 1904, we have an interesting article by "More Light" on "Proportionate Fellings in Sal Forests," which the author concludes with an invitation to criticism. I venture to make the following remarks in the hope that the result will be "more light."

In the first place the title of the article is an unfortunate one, likely to lead to confusion in the minds of those who have followed the discussion on "Proportionate Fellings." This began, I believe, with an explanation by Mr. Gleadow in March 1901, of a method advocated by M. Broilliard in the *Revue des Eaux et Forêts*. Mr. Gleadow finally stated that the method was only suitable to complete and uniform crops, though I see no reason why it should not be applied to a properly stocked irregular crop under the selection system. That "More Light" considers his system the same as, or a mere modification of, M. Broilliard's is shown by the title of his article and the following on page 449—"We cannot therefore associate ourselves wholly with the view that Proportionate Fellings can find no place in half-ruined forests." "More Light's" scheme bears no resemblance at all to M. Broilliard's and therefore his title is a confusing misnomer. This requires a short justification.

I understand M. Broilliard's "Proportionate Fellings" in the case of a forest under the selection system to be this—

Assume we are dealing with a European forest which has been under regular treatment for a considerable period and which for all practical purposes is normal in density, quality and distribution of the age-classes. It is known from measurements in sample plots that it takes, say, 30 years for the oldest age-class to be replaced by trees in the next oldest. It is decided to visit every part of the area once in ten years. It follows that the mature stock will be removed in the course of 30 years by taking one mature tree out of three at each felling. In the course of ten years one-third of the second age-class will have become mature, consequently the proportion at the second felling will remain one out of three and the same at the third felling. The main idea is that *all preliminary enumerations are avoided* and no faulty calculation of the possibility is made. The crop being complete, no great variations in annual yield can take place if equal areas are treated every year. As far as I understand Mr. Gleadow's explanation, the question of thinnings in the younger age-classes is not included, though it is not impossible to extend the method to them, but as I hope to show further on it is doubtful if such operations lend themselves to regulations by calculations of any sort.

On the other hand, the first necessity in "More Light's" method is a full enumeration of the whole growing stock. The figures thus obtained are to be compared with a calculation of the normal growing stock and the result is to be used as a check on over-felling or underfelling, according as the girth-class under treatment is in deficit or excess.

Taken literally the words "Proportionate Felling" mean any felling in which one takes a proportion of the trees; in other words, any felling which is not a clear felling. In this broad sense "More Light's" method is a proportionate felling, but it is certainly not the method originally given that name by Mr. Gleadow.

We can, however, turn to another method for treating sal forests, put forward by Mr. Gleadow, for a parallel to "More Light's" proposals. This is his method of "Storeyed Forests"

explained in the *Indian Forester* for February 1900. Though the able author may object to my saying so, this method comes legitimately into a discussion of sal forests under the selection system, for I can only see in it the selection system worked out to its theoretically correct end of treating *all* girth-classes and regulating their proportions. In the method of storeyed forest it is proposed to calculate the normal proportion of each girth-class by measuring the areas of crowns and with a knowledge of these figures to make use, at each felling, of the trees in each girth-class in excess of those required in the next higher, and in abnormal forest to regulate our fellings so as to gradually introduce the proper proportions on the ground. "More Light" proposes exactly the same thing. However, there are two differences in the detail of the systems. Firstly "More Light" proposes to enumerate the whole stock first and then to calculate for each girth-class whether it is necessary to mark surplus trees or avoid fellings altogether. Mr. Gleadow, on the other hand, would mark the proper proportion on the ground in reserve and fell the balance, if any. He thus spreads his enumerations over the whole felling period, but he loses the advantage of being able to equalise the annual outturn approximately. Secondly, "More Light" omits altogether the theoretical possibility of felling all the trees in any class in excess of those required in the next higher—he confines himself to removing the excess over the normal proportion of the class itself. For example, the proportion of II class trees at commencement of a felling is 12 per acre, of III class 17—on the ground there are 24 III class. "More Light" only proposes to fell $24 - 17 = 7$ III class, whereas he might fell $7 + (17 - 12) = 12$. The crux of both methods, or, as we may more truly say, of the *one* method, is the utilisation of crown-areas for a knowledge of the normal growing stock. This idea has, to my thinking, a fatal fallacy, a fallacy which "More Light" fails to recognise, and therefore his scheme falls to the ground. Mr. Gleadow fully recognised the fallacy; and indeed an important part of his article on "Storeyed Forests" is concerned with explaining it. Nevertheless, although he gives us no idea of how he proposes to get over

the difficulty, he continues to advocate "the crown-area" theory.

The fallacy lies in the assumption that each girth-class occupies an equal portion of the area in a normal forest. The statement that this is not so was described by Mr. Gleadow as the "Gurnaud principle." It is easy to be wise when one has been told how a thing is done, yet I think that we hardly need M. Gurnaud to tell us that in a properly stocked selection forest the youngest of five girth-classes, or the next youngest, does not require or get one-fifth of the total crown-area all to itself. One does not need to go ten yards in a sal forest without noticing that much of the available crown-area is occupied by two or even three girth-classes at once. Mr. Gleadow was therefore reduced to assuming the proper area required by each girth-class, and we are therefore no nearer a knowledge of the proper proportions of the girth-classes in a normal sal forest than we were before. This was pointed out by Mr. Leete in his article on "Sample Plots," Part IV, à propos of the working plan for the Kheri Trans-Sarda Sal Forests which he was then writing. For want of the necessary knowledge of the normal proportions of the girth-classes, he was obliged to limit his treatment of the sal forests to the removal of mature trees and of rotten material from the smaller girth-classes, but he fully recognised the possibility of utilising the excess material in the smaller classes and made most practical suggestions for obtaining the necessary data.

We have spoken so far as if we would be glad to fall in with the scheme of conducting the whole of our fellings on the basis of comparison of actual and normal growing stocks, if we but knew what the latter really is. As we do not know it we have time to pause and ask if this comparison would really prove so useful. I do not deny that if we knew the normal number of I class trees per acre, it would be very sound to see that we had something more than that number of II class trees on the ground before felling any trees of that class or before removing any excess in the III class.

Also, in case the II class were in excess of the number required for a normal I class, it would be possible to remove the

excess without endangering the quality of the crop. The principle might possibly be extended to class III. But when we get to the still younger classes the question is different. Suppose as before the normal number of II class trees is 12 per acre, of III class 17 and IV class 20, there are 24 III class trees and 30 IV class on the ground. We can theoretically remove 12 III class and 13 IV class trees per acre, but to do so would be to ruin the forest. Both Mr. Gleadow and "More Light" fully recognise this and only advocate the use of the comparison as a guide. The question then arises forcibly—Is not the difference between what you can fell theoretically and what you can fell actually so great that the guide ceases to be any guide at all. Not only this but "More Light" proposes to carry out thinnings twice in the period in which one class passes into the next higher, which makes the guide more shadowy still. Moreover, I am inclined to consider the original proposition that the trees in class III, in excess of the normal number in class II, are theoretically removable, a fallacy. Is it not more correct to say that theoretically all the trees are required to produce the requisite amount of upward growth, but experience shows that the crop profits by judicious thinnings. We shall do better then to exercise our minds in determining what is a good silvicultural thinning among sal poles rather than with calculations of normal numbers of trees per acre.

To return to our numerical example, we have decided that the removal of the $17 - 12 = 5$ III class trees is probably better regulated by the study of silvicultural thinnings than by calculations and that of the corresponding IV class certainly so. It still remains possible, as proposed by "More Light," to remove the $24 - 17 = 7$ III class trees and $30 - 20 = 10$ IV class and thereby to introduce the normal proportions in an abnormal forest; but it is done by utilising a large quantity of immature stock. It would be apparently far sounder to remove the excess from the present III and IV classes when the trees are mature, by keeping the surplus to supply the deficiencies in the present I and II classes or at least to compromise by spreading the process over

a considerable period. By that time we may know the normal proportions and the question will be within the boundaries of practical forestry. Further, I think it will be found in practice that all this talk of removing excess III and IV class trees on the assumption that so much is being added to the deficit in the V class, resulting from the felling of a deficient I class, is nothing but talk. A large proportion of the III and IV class trees do not stand scattered about as they should do, but are in large groups, and to remove trees would reduce the number in the class, but in the absence of seed bearers would do nothing towards the production of regeneration. As already indicated, the only thing required in such areas is a judicious thinning.

I am not aware that any working plan for sal forests under the selection system has yet gone further than providing for the removal of mature trees under silvicultural rules with a check, based on enumeration, against overfelling by reason of a possibly too short felling period, combined with removal of really useless and rotten trees in the other girth-classes. The last working plan of this kind brought out certainly shelves the question of thinnings. I venture to put in a precise form a few suggestions for a slight advance in the present and with indications for the future—

(1) That enumerations of the stock should be used to equalise the outturn from mature trees by departing from the system of possibility by equal areas.

(2) That with a knowledge of the normal proportion of a class trees per acre, we should arrange to provide something more than this number of II class on the ground.

(3) That failing this datum at present, the enumeration of stock should certainly be used for seeing that we have on the ground after felling at least as many II class trees as we have had I class, with a liberal addition for casualties and trees which never attain the I class. This principle could be extended to III class, if necessary.

(4) That it may be found advisable eventually to provide a normal number of III class trees on the ground, as for II class

trees, but that probably III class had better be treated with IV class on silvicultural lines only, *i.e.*, by thinnings.

(5) That in the immediate future working plans should provide for judicious thinnings of clumps of sal poles and not restrict the removals to absolutely rotten stems. What is a judicious thinning will be a difficulty, but if we never try we shall never learn. Whilst the conditions in other circles are, doubtless, different, in this circle, at any rate, the Divisional Officer would certainly have spare time available to devote to thinnings.

It is perhaps hardly necessary to add that in the case of ruined sal forests, the absolute necessity for getting rid of large quantities of worthless trees in the larger girth-classes must prevent any attempt at making provisions for the future in the matter of II and III class trees, but it is here assumed that we are dealing with forests which have already been treated with improvement fellings.

F. F. R. CHANNER.

NOTE.—The girth-classes referred to are 18 inch classes ; class I being trees over 6 feet in girth and class V, 0 to 18 inches. The question of whether these are the best classes is not considered here.

ON CERTAIN IMPORTANT FOREST QUESTIONS.

In his letter in the February number of the *Indian Forester* Mr. Gamble states that Mr. Hauxwell and myself consider that things are all right now. I can find nothing in my letter in the number for May 1904 to justify such a conclusion, which certainly does not correctly represent my opinion.

The only sentence in my letter on which Mr. Gamble could possibly have based his conclusion was the one quoted below, and there were many others from which he might have drawn quite a different one—

“ I may add that I don't think we should have much difficulty in respect of money for improvements if we had or could obtain the necessary establishment to carry them out. ”

S. CARR.

THARRAWADDY:

23rd March 1905.

THE DECREASE OF FIRES IN THE NORTHERN CIRCLE,
BOMBAY.

With reference to my recent letter (printed in the May issue) on the decrease of fires in the Northern Circle of Bombay I have a modification to introduce, which did not occur to me at the time of writing, although perfectly well known. Without diminishing in the least the credit accorded to the Collector, it is nevertheless necessary to record the other cause, which is the *abolition of "kolpat"* (deadwood) *contracts*. Revenue was formerly made by selling a quantity of green timber at certain prices, and a quantity of dry timber at smaller prices, the contractors choosing the trees. Of course they burnt the forests wholesale and even piled dry wood round specially fine trees. Such a system was a terrible shock to my nerves when I first came to this circle, and I did my utmost to abolish it, but the effective agent was the introduction of Working Plans. Still there were lots of other causes of fires, all but a minute few being traceable to privileges or incendiarism. Complimenting a certain Revenue Official the other day, I referred to the great diminution of fires and asked the reason. He said at once "Well, sir, you know the relations between Forest and Revenue Officers were not quite the same in those days."

I am glad to see my old friend J. S. Gamble to the fore. He was, I thought, unnecessarily and uncivilly attacked, and I am glad to see that he has the best of it. I certainly did not take his "Old Forester" as a slighting expression, but the contrary.

F. GLEADOW.

COAGULATION OF THE LATEX OF *FICUS ELASTICA*.

I noticed in an article on the above subject in that estimable journal the "Agricultural Bulletin of the Straits and Federated Malay States" of January last that Mr. P. J. Burgess makes a statement that *Ficus elastica* latex refuses to coagulate, and that he has devised a method of churning it up with a 2 per cent solution of tannic acid in the proportion 5 parts of solution to 95 latex. He also states that the *Ficus elastica* yields an abundant latex which

can be easily collected and which is quite liquid and remains so for an indefinite time.

It may perhaps interest your readers to know the experience of one who has tapped and watched the tapping of *Ficus elastica* trees for the last three years in the Government Plantations of Charduar and Kushi in Assam, where the latex of *Ficus elastica* by no means remains liquid for long. The cuts are made by a V-shaped chisel or gouge devised by Mr. D. P. Copeland, Deputy Conservator of Forests; they are made at right angles more or less to the line of growth of the stem, aerial root, or branch at one and a half feet apart half round the trunk, aerial root or branch that may be tapped. Cuts made vertically to the line of growth do not yield so much rubber for a similar length of cut as those made horizontally. Endeavours are made to cut only just down to the cambium layer and not into the wood so that the wound may heal as soon as possible. Immediately after the first cut the latex flows freely, fills up the gaping cut and flows over, but before very long, say within two minutes at the outside, the flow ceases because the latex begins to coagulate of its own accord in the cut. Arrangements are made to collect the latex that falls on mats made of thin strips of bamboo woven together. Little boys on the ground shift these mats about under each cut as the man up the tree makes it so that the dripping latex can cover the mat. Before the end of the day this dripped rubber has joined together on the mat and has coagulated and formed a regular skin, which on drying can be pulled off, say, in 48 hours or less sometimes and be further dried. The latex which has coagulated in the cuts turns a reddish brown colour, highly appreciated in the London market, and is pulled out of the cut in about 48 to 56 hours, afterwards yielding fine elastic fids of rubber.

This rubber is then slightly handpicked to get rid of pieces of bark, dirt, etc., and is laid out on shelves in an open shed to be air dried. After drying this fine red rubber which coagulates in the cuts is pressed by a screw press in cubes of one hundredweight each, which are wrapped round with cheap white cloth and a double covering of gunny bag. The cubes retain their shape and are easily

portable. Such rubber has fetched four shillings and three pence a lb. recently in the London market. The latex which dripped on the mats is similarly cleaned, dried and packed separately and realizes very little less. This latter, which we locally name "mat" rubber, is sometimes liable to ferment as some interior portion of a large drop of latex has not perhaps properly coagulated, and hence at times this rubber sometimes fetches a penny less per lb. Formerly mat rubber used to turn black and did not fetch so much.

Latterly I ordered the mats to be soaked in a solution of the bark that comes off the tree in tapping. This dyes the mats red. The white latex when dripping down seems to be tanned by this dye on the mats in a similar way to that in the cuts where latex rests and coagulates. The reason for early coagulation is perhaps due to this tannic acid effect of the bark on the sides of the cut and the dye on the mats. The "mat" rubber we export is mostly red. Of the whole outturn of our plantations, some 15,000 lbs. last season, the proportion of "mat" rubber to that collected from the cuts as coagulated very elastic rubber was only 25 per cent of the whole outturn. The method of collection seems therefore as good as can be devised. Of course it is more costly to win this latex from the *Ficus elastica* than it is to win latex from the Para (*Hevea braziliensis*) tree owing to the fact that the men who operate have to climb the trees twice to get the rubber.

CAMP DARRAGAON,
GOALPARA DISTRICT :
The 6th April 1905.

E. S. CARR,
Conservator, Forests,
Assam.

THE GREAT FROSTS IN NORTHERN INDIA IN 1905.

The very exceptional cold of the present season in India seems to have attracted a good deal of attention, and I have seen it stated that it is probably the severest cold that has occurred for perhaps 100 years. It may be interesting therefore if I mention two instances of excessive cold that occurred to myself during my tenure of office as Conservator of Forests, Central Provinces. The first case was in January 1860, after Lord Canning's visit

to Jubbulpore. After the Viceroy's camp broke up about 20th January, I marched east *vid* Sohaypur into Munola, when the whole of the vegetation, which was partly grass rhumna and partly scrub jungle, was covered with a thick coat of hoar frost, just like a winter morning at home. This occurred, I think, three days running, but one day was particularly severe. This was, I think, the only case I recollect of real hoar frost in the plains.

The other case was in the Melghat forests of the Taptee Valley in Berar, so late as March in the year 1864, when for about a week thick ice formed in all the vessels exposed in my camp, and I had to get up and sit by a camp fire because I could not sleep for the cold in the small pal tent I had with me and not too much bedding. Both localities are about 1,200 feet above sea level, as far as I recollect.

GEORGE F. PEARSON,
Colonel, late I. F. D.

THE MADRAS FOREST MEMBER'S TOUR IN ANANTAPUR.

In the January number of the *Indian Forester* an article was published on the Madras Forest Member's tour in Anantapur in which was repeated an incorrect statement taken from the Forest Member's report. I refer to the age of the "fences" of some of the reserves, which were not erected in the famine of 1876, but in the years 1885, 1886, 1887, and possibly later. Most of the walls were built while I was in charge of the district, and with one exception they were built round the poorest and most unpromising reserves I could find, and they were alternately praised and condemned by several Conservators; I have not seen any of the fenced reserves since 1887, but if some of them (the Gootoor reserve for instance) now contain anything in the shape of woody growth, it must, I think, be admitted as the moral effect of the stone wall, for until this was built there was not a headload of wood, green or dead, per acre on most of the slopes.

In the adjoining district of Cuddapah somewhat similar walls were built in the famine of 1876 ; in many places the walls were barely two feet high and offered no appreciable obstacle to the wilful passage of man or beast, yet their moral effect was such that ten years later the growth inside the walls stood up like a six foot wall while outside the walls it was grazed, browsed and lopped to within two feet of the ground ; the reserve boundary was visible from a distance of fully three miles owing to the clean line of untouched growth.

SALEM :
29th March 1905.

F. LODGE.

REVIEWS AND TRANSLATIONS.

REVIEW OF THE FOREST ADMINISTRATION IN BURMA 1903-04.

There has been considerable progress in the forest administration of Burma during 1903-04 in spite of the increasing difficulties experienced owing to the inadequacy of the controlling staff and the weakness and frequent incompetency of the subordinate staff. The area of reserved forests was increased during the year from 19,709 square miles to 20,038 square miles. Demarcation is also being kept well up to date, 513 miles of new reserve boundaries being demarcated during the year. It is to be regretted that owing to the paucity of trained officers progress in Working Plans has not been so satisfactory as it ought to have been, only four parties having been at work instead of the eight parties prescribed in the programme of Working Plans drawn up in 1902. Considering that the area under working plans is at present a mere fraction of the total reserved area, that allowance will have to be made for annual increases in the reserved area for some years to come, and that before many years are over some of the earlier Working

Plans will come up for revision, the outlook is indeed a gloomy one.

Fire protection has, owing chiefly to an exceptionally short dry season, been unusually successful for Burma, the area burnt amounting to slightly over 6 per cent of the total area attempted as against 23 per cent during 1902-03.

The area attempted was increased from 4,744,652 acres to 5,216,560 acres. The all-important subject of the effect of prolonged fire protection on the natural reproduction of teak has been touched on in the reports of all four circles. The opinion appears to be gaining ground among Conservators and Divisional Officers that under certain conditions fire protection is highly antagonistic to successful teak reproduction; what the precise conditions are is not clearly stated, though it is generally agreed that in so-called moist forest the injurious effects are most marked. A quotation from the report of a Conservator schooled to the beneficial effects of fire protection in India, and who has but recently been transferred to Burma, may in this connection be not inapt—"In moist forests which have been under fire protection for a length of time the state of affairs is unsatisfactory in the extreme. The longer such forests are protected the denser becomes the growth of the various bamboos and of inferior species, and teak seedlings cannot and do not survive even if they establish themselves." This is a subject which we confess we should like to see probed to the bottom. The circle reports are not wanting in plain outspoken opinions by various officers whose reputation and experience can hardly count for nothing, and it is but right that their opinions should be duly weighed. The only satisfactory solution of the difficulty would appear to be to conduct practical experiments and record observations in a systematic manner and on an extensive scale; this can be practicable only if carried out by one or more officers on special duty.

Turning to artificial reproduction, we find that *taungya* plantations (chiefly teak and cutch) were extended by some 3,500 acres, almost exclusively in the Pegu and Tenasserim Circles. The total area of teak and cutch plantations in the Province is not

given, but the area in the Pegu Circle is stated to be 65 square miles, the plantations being dotted about the forests in more than 3,000 blocks. We are not surprised at the Conservator's remark that "the efficient supervision and up-keep of these plantations is far beyond the power of the Divisional Staff, and some of the plantations bear signs of having suffered for want of attention for many years past. This is extremely regrettable considering the enormous value of these plantations, which, acre for acre, probably surpasses that of the best plantations in Europe." We feel inclined to look askance at the extension of plantations when so little is done to improve the natural teak forests of the country, important operations such as climber cutting and improvement fellings having been carried out over an infinitesimal proportion of the area of reserved forests. It is satisfactory to note that experiments for ascertaining the best means of inducing and assisting teak reproduction have been started in more than one Division. This is a subject on which our knowledge is very incomplete, and while applauding the efforts of those officers who have devoted much time and energy to the matter, we venture to think that many experiments are foredoomed to failure for want of continuity of action when transfers of officers are frequent, and that such experimental work could best be dealt with by a special bureau.

A successful floating season has resulted in larger deliveries of teak than in the case of the previous year. The extraction of other timber shows steady development, although the development is retarded for want of good means of communication. The number of teak trees girdled was 66,550 as compared with 60,475 in 1902-03. The total outturn of timber and fuel during the year was 48,547,381 cubic feet, while the total value of minor produce extracted was Rs. 4,48,260. The gross forest revenue of Burma for the year was Rs. 85,19,404, the expenditure Rs. 35,00,311, and the surplus Rs. 50,19,093; the surplus is thus 59 per cent of the gross revenue. The surplus for 1903-04 is nearly $12\frac{1}{2}$ lakhs in excess of that of the previous year, the increase being due chiefly to a good floating season combined with a rise in the price of teak.

The Conservators again lay great stress on the need for strengthening all the branches of the service. Schemes for the formation of new divisions, the reorganisation of the service, and the appointment of a head administrative Forest Officer for Burma have, we understand, been under consideration. Until these schemes have been fully considered and finally sanctioned some time must necessarily elapse, while the paucity of officers will be felt for some time after the new appointments are sanctioned.

SHIKAR, TRAVEL AND NATURAL HISTORY NOTES.

KHEDDAH OPERATIONS IN BURMA AND AFTER.

In 1902-03 the Kheddah Department started work in Burma, in the Katha district, and captured about 250 animals. The Katha district is mainly composed of a wide valley down the centre of which runs the railway; on either side of this are, in many localities, huge expanses of flat ground stretching away to the foot of the hills. In former times these were cultivated fields, but for years past they have been covered with tall elephant grass, and have formed the home of the elephant, bison, sambur, pig, etc. Roads there are none. The only means of getting from village to village was to follow one of the numerous elephant paths through the grass. This grass usually burns in the hot weather, but in the abnormal season of last year the rains broke so early that little, if any, of the grass was burnt, with a result that this year it is almost impenetrable. Certain villagers have now petitioned the Deputy Commissioner that they are unable to move about the country owing to there being no wild elephants to open up paths. This is a result of Kheddah operations that would hardly have been anticipated, and it would be interesting to know if the same had been observed in India. But it is not only the people that have been inconvenienced. Bison and other game that used to wander along the elephant paths have this year almost deserted these plains, and unless there is a good

burning next hot weather these favourite shooting grounds may be permanently injured.

CAMP :

H. S.

16th January 1905.

[We feel sure that our readers will join us in our feeling of deep and sincere regret that this is the last article which will appear under the initials of H. S., well known throughout Burma as those of the late Herbert Slade, Conservator of Forests.—
HON. ED.]

A HOLIDAY IN CALIFORNIA: LETTERS FROM T2.

THE YOSEMITE VALLEY, CALIFORNIA.

The Yosemite Valley is a wonderful place. Imagine a ditch 7 miles long and two broad with perpendicular rock walls 3,000 feet high. We had two days staging to get out here, first 44 miles with 6 lots of horses, and next 26 with 3 lots. The Americans, as a rule, do the round trip in four days; such a rush that most get back dog-tired and disgusted. A quarter of the road is oiled, the rest is terribly dusty, and the jolting is awful. This stage riding is a great experience. It is wonderful how they get through and nothing breaks down. At the half-way place I spent a day seeing the big trees, *Sequoia gigantea*. They are magnificent. Near Santa Cruz, on the sea coast, where we have been staying, I also saw the other kind—the smaller common kind, *Sequoia sempervirens*. My friend's fruit ranch (peaches and grapes) is in the hottest part of California; the usual daily summer maximum is over 100°. People work all day in that heat and with only a light straw hat and yet sunstrokes are very rare indeed. It is so dry up here in the Yosemite; we are 4,000 feet high and the temperature is very nice. The trees here are just such as one has read about. Bushes of Chapparral, Manzanita, Buckeye, Sage, Nut Pine below. Higher up Yellow Pine, Sugar Pine, Red Fir, Incense Cedar. These are splendid trees. Near Santa Cruz I visited one saw-mill, and here on the way up passed near another, which I hope to visit. For the last two months the papers have been full of forest fires. One near Santa Cruz burnt down five saw-mills, and that was not half the damage done. They were engaging men anywhere and everywhere at

a dollar and a half an hour—six shillings an hour. Put that into rupees! These are of course bush and tree fires, not just ground or leaf ones.

This country is a very expensive one to live in; the smallest coin in general use is 5 cents, *i. e.*, $2\frac{1}{2}$ pence. On a ranch it is of course more economical, but there you have to do everything for yourself. Hired labour is so expensive.

People talk about red tape in India. It seems pretty bad here. We had an awful experience of the Customs. They are worse in San Francisco than in New York. They opened every box and fussed about little things, and said we visitors had to pay duty on them because they were still in the shop paper, and after all this bother, the duty was very little more than what we had ourselves first declared. Again, on the Railways when you get a reduced tourist return ticket, you have to sign your name on the ticket, and if the clerk cares to enter it there are printed entries on the margin for sex, size of body, colour of eyes, hair, age.

All this apparently is the result of so many big swindles. There are people so sharp and there is such a rush after the dollar, there is often also so much suspicion, and rightly too, of any official's conduct that he *dares* not use his own judgment. It really amazes an Englishman to see what libellous articles they have in the papers, and leading articles too, and giving details of names, etc. But there is no doubt about the people working hard and getting through their work quickly.

If you ever travel round this way home, I should advise you certainly to go *via* Vancouver. From all accounts the Empress boats are much more comfortable. On the Pacific Mail everyone complained about the food, and fancy the "Mongolia," a hot climate Phillippine boat, had no iron windsails for the cabin portholes. The Americans get things done or "through" as they call it, but they are a bit "casual" about it.

THE SAN JOAQUIN VALLEY.

My friend's ranch is a vineyard in the San Joaquin Valley between the coast range and the main hills, and lying about half

way between San Francisco and the south border of the State. He also grows peaches and oranges. All the land about here is irrigated. For watering cattle and also domestic use, the people here make great use of aërometers for a supply of water. They are not expensive, the chief cost being the cistern in which the water is stored, and the height at which the cistern is placed. Having water laid on through the house is a great convenience. It is also a great help for the garden, and very useful in case of fire.

A friend in the Royal Engineers has also been here. About a month ago we two went down to the south border of California on a visit to a mutual friend, who is working a "half section" as it is called here, *i.e.*, half a square mile. His land actually touches the Mexican boundary at a place called Calexico, just over the boundary being Mexicali. Both names are made up from California and Mexico. The land round Calexico is all desert, "The Colorado desert," or rather was. Within the last six years water has been brought in from the Colorado river to irrigate nearly a thousand square miles in California alone, and in Mexico, just south of the border, there is another thousand which can also be so treated. We had thus a good example of an American "boom," and a solid boom too.

It is a fine irrigation work, but there is nothing wonderful about it. The land is beautifully level and slopes back north till it is 250 feet below sea level. It is plainly the bed of an old sea—very fine clay earth full of tiny shells, with old sea beaches sloping down from the hills all round.

Our host is mostly engaged in raising cattle and hogs. He has now become quite American and a typical cow-boy, tall and lean. Says "yep" and "nope" for yes and no. He took us for a week's shooting trip into Mexico. He and I rode on the "buckboard," which also carried all our outfit, and the sapper rode. We also had another man and his wife on another buckboard. None of us had before been on this road, which was all through the desert. After going all day we struck water, and concluded to pitch camp, but the water was salt. We were very nearly making a dry camp,

and I had visions of my bones being left in the desert. However our host urged on his mules with his "gee-hup, Pete," etc., and soon we found ourselves in an inferno, which in Japan would be called "Big Hell"—bubbling mud volcanoes and boiling sulphur springs with apparently nothing but salt lakes to relieve one. Finally just after dark we got to fresh water and a camp of Americans staying here for their rheumatism. We moved camp next day, but while packing up suddenly saw two of the other man's horses loose and trotting home. Our host jumped on quick and rode back, but had to go six miles off before he could round them up. That day we slept near a camp of a big American Cattle Company, which has rights over a thousand square miles in Mexico. The country down here was more bushy, the principal growth being "Mesquite," which has a very strong resemblance to the Cutch (*Acacia arabica*) tree in Burma. We had two days' very good quail shooting, but deer we could not find. The second day we had another experience of the desert and its way. The R. E. man got lost. Next morning we hunted for him, but he came in himself before mid-day. He had been lost a whole day, had reached the river about sunset, did not know if camp was above or below, made a fire, and spent the night cooking quail and himself alternately. The trip was a great contrast to Indian camping. We of course had to do everything ourselves, had no bedsteads, but had to sleep on the hard ground under the sky. This in November! The early morning was cold, but the desert air is so dry, there is no dew. The winter climate here is perfect—beautiful clear sky with not a cloud. On this trip the cooking was done by my American friend. He was especially good at the American breakfast dish—hot cakes. An American thinks nothing of eating 15 to 20 of these each morning, so it is not wonderful if he suffers from the common complaint—indigestion.

Our host of course showed us how to lasso. One day the R. E. went out on foot to catch a horse and did make a splendid throw, catching the animal round the neck as it rushed past. He hung on tight, so tight, that next moment he was on his head and had to let go again. However, he caught it eventually.

EXTRACTS FROM OFFICIAL PAPERS.

THE FIBRE OF HIBISCUS TILIACEUS AND OTHER PLANTS
AS SUBSTITUTES FOR JUTE.

An article on "Jute in Burma" having appeared in the *Rangoon Times* of the 25th August 1904, my attention was invited thereto by the Local Government, and a report was called for. With the approval of Government I send you the following account :—

OCCURRENCE OF HIBISCUS TILIACEUS IN BURMA AND REPORT ON THE
SUBJECT GENERALLY.

Hibiscus tiliaceus (Burmese *Thinban Shaw*) belongs to the natural order Malvaceæ and is allied to the cotton plant, to which its flowers bear a close resemblance, both having large bright yellow petals with a claret-coloured centre. It is plentiful in Lower Burma, generally along the tidal rivers and creeks, and this would seem to show that it thrives best on a saline or moist soil.

FIBRE.

The *Thinban Shaw* yields a fibre of average quality, which is probably more durable than jute if subjected to wetting, and would consequently do better for sacks which may have to stand on damp ground. It is a matter for planters or Government to decide whether its cultivation at the present day would pay better than that of other crops. In the case of China grass (*Rhea*) the manufacturers expect the cultivators to produce the raw material in large quantities before they will guarantee a high price for it ; yet the pre-eminent qualities of this fibre are well known. With a less famous fibre, as the one we are now considering, desultory experiments are not likely to attract capital. An experiment of this nature has been tried by Mr. Le Fevre, but was discontinued evidently for want of sufficient capital. It takes time for the special qualities and the most suitable mode of treatment of a new fibre to be learned by manufacturers who may have to order special machinery for dealing with it ; consequently

producers must be prepared to wait for profits until the produce they offer has not only established itself in the estimation of buyers, but taken a firm hold of the market.

LOCAL MANUFACTURE OF GUNNY BAGS.

It is quite probable that the Thinban Shaw or other suitable fibre would pay if the plant were cultivated and the fibre locally manufactured into gunny bags which are so largely required in Burma by the paddy and rice trade. It has been suggested by the Editor, *Rangoon Times*, that this might be done by hand looms in the villages, but owing to the want of enterprise and industry on the part of the inhabitants this is doubtful. Government might, however, grow the fibre or buy it from the cultivators and make it up into gunny bags at the jails.

VALUE OF THINBAN SHAW.

If this fibre were sent to market in the condition that jute is usually sent, it would probably fetch about £12 per ton or perhaps a little more. From the account given by Mr. Le Fevre he was offered £20 to £35 per ton. His specimens may possibly have been prepared with more than ordinary care, and thus have obtained higher quotations for a more highly finished article than the ordinary Calcutta jute. In fact, I am informed that he has a secret method of treating the fibre. He states that he worked it up into rope, matting, and gunny, and also dyed the fibre in different colours. Unfortunately he could not supply me with samples. The prices obtained by Mr. Le Fevre are very high, even at the lower quotation of £20, as the length of the staple was only 4 to 5½ feet, whereas Bimlipatam jute is said to average 7 feet and Naraingunge jute (the real article) 8 feet in length. It would no doubt be possible in cultivation to obtain Hibiscus fibre up to 8 feet in length.

NATURE OF THE CONCESSION GRANTED TO MR. LE FEVRE.

Mr. Le Fevre, who now resides in Rangoon, was granted a free permit to collect the fibre from July to December 1900, in the unclassified forests of the Toungoo district. In October 1900 he

applied for and was allowed an extension for one year. Nothing further was heard of the venture until I saw Mr. Le Fevre's letter in the *Rangoon Times* of 31st August 1904. I have since been informed that altogether $2\frac{1}{2}$ tons of fibre were cleaned and prepared by manual labour and disposed of through Messrs. Finlay Fleming, Edmund Jones and Deacon Clarke, of Rangoon. The price realised is said to have been £35 per ton in England or Rs. 5-8 to Rs. 6 per maund in Calcutta. Mr. Le Fevre was obliged to stop work as the help which he had been promised was not forthcoming.

OTHER PLANTS YIELDING SUITABLE FIBRES.

HIBISCUS CANNABINUS, L.

The Mesta-pat of Bengal could be cultivated perhaps more extensively than Thinban Shaw, and in drier parts of Burma. This plant is already profitably cultivated in Vizagapatam district, Madras Presidency, and has been placed on the home market as a special kind of jute—Bimlipatam jute. (See No. 11, Agricultural Ledger, 1903.)

ABROMA AUGUSTA, LINN. F.

This sterculiaceous plant is mentioned on page 241 of the ledger referred to above. It grows in the Darjeeling Terai and possibly also occurs in South Tenasserim. It has not yet been met with in Burma by the writer and has apparently not been recorded from this Province.

VILLEBRUNEA INTEGRIFOLIA, GAUD.

(Kurz Flora, Vol. II, page 427, under *Orcocinde sylvatica* Miq.) The *Bonriha* of the Assamese. The Nepalese name of this is *Lipia* and the writer knows the fibre to be excellent.

MAOUTIA PUYA.

Wedd. (Burmese *Sat Sha.*) Kurz on page 429, Vol. II, says this is frequent in the drier hill forests of the Martaban Hills at 2,500 to 5,000 feet elevation, often springing up in deserted hill taungyas, and that it yields a strong fibre resembling rhea. The writer knows this fibre also to be exceedingly strong and durable. For gunnies and similar uses it should fetch a higher price than that paid for jute bagging.

GIRARDINIA ZEYLANICA DENEVAR HETEROPHYLLA.

The Nilgiri nettle. (Burmese *Petyagyi*, Karen *Latsa*.) This is plentiful in moist places, *e. g.*, at Thagyo on the Kabaung river. The fibre which has been frequently reported on and exhibited, is very strong and durable and quite suitable for gunnies. The writer knows this fibre well and has had it made up into a coarse cloth, which is practically imperishable.

In the above list only those plants have been included which are not known to fame but which yield strong and durable fibres. If the gunny bag industry is successfully started the preparation of fine textile fibres and the utilisation of the waste tow, *e. g.*, for string, twine, paper-making, etc., is sure to follow. At the recent agricultural show of the Straits Settlements and Federated Malay States, held at Kuala Lumpur, it is said that a Mr. Schiemer has been very successful in preparing fibres by his new machine.

Mr. Le Fevre has been asked to prepare fresh samples of *Tuinban Shaw* fibre for valuation as those previously prepared are not now available.

RANGOON :
27th January 1905.

F. B. MANSON.
Conservator of Forests,
Tenasserim Circle.

MISCELLANEA.

THE INDIAN FOREST SERVICE IN THE HOUSE
OF LORDS.

We reproduce the following extract from the *Pioneer* * since, whilst displaying the curious ignorance existing in the highest quarters on the subject of the training required by the Forest Officer, it at the same time affords considerable insight into the nature of the future training to be given to the recruits for the Imperial Service.

* Allahabad *Pioneer* March 30th, 1905.

In the House of Lords on Tuesday, the 7th March, the Earl of Lytton rose to call attention to the scheme at present under the consideration of the India Office for the removal of the Forest Department now at Coopers Hill to the University of Oxford, and to move "that in the opinion of the House the Indian Forest Service should be open to all the Universities of the United Kingdom." He said that this question involved an important principle, which was vital to the interests of the Universities. This principle was whether the right of admission to an important branch of the public service should be confined to one University endowed out of public funds or whether, as had always been the case in other branches of the public service, it should be thrown open to all candidates of Universities alike on equal terms. He sketched the history of the question, pointing out that Coopers Hill College was shortly to be abolished, that the School of Forestry there was to be transferred to Oxford, and that it was intended to hold an examination of all students at the end of the first year at the University. The proposals had aroused a great deal of hostility on the part of the authorities of other Universities, in the belief that they would be shut out from the opportunity of providing candidates for the Indian and Colonial Forest Service. The authorities at Cambridge had protested; and the Secretary for India stated in reply that it was considered essential that the Professor and Assistant Professor of Forestry hitherto entrusted with the work at Coopers Hill should be placed in charge of the training at the University, and that it was inevitable that one University, and not more than one, should be selected for the purpose of education. But the point of importance was whether or not it was essential that the necessary training for the Forest Service should be confined to one University alone. The protest which he entered was not directed against the selection of Oxford but against the selection of any one University to the exclusion of all others. The other alternative scheme which had been submitted involved the free and open competition of all educational establishments. The students should be free to choose their own University, go through the

ordinary three years' course, take their degree, undergo a scientific training at the laboratories and an examination finishing up with two years' practical forestry training in one of the Continental forests. By this scheme the public money obtained from the revenues of India would not be spent at one institution, and it was certainly believed that it was possible to devise a scheme which would be more in the interest of the service and fairer to all the Universities of the country. In conclusion, he assured the noble Marquis who would probably answer him that the feeling of hostility to the proposals in regard to Coopers Hill was not confined to Cambridge alone, but was felt by other Universities in the country, and that it was a very strong feeling. If no assurance was given that the decision would be postponed and further inquiry held, then the feeling he had indicated was sure to find some very forcible expression. He hoped that Parliament would refuse to sanction a scheme so unprecedented in character and which in its operation would be so manifestly unfair.

Lord Thring reminded their Lordships that a great deal of money had been spent in recent years upon improving Coopers Hill College, and said no one now could deny that it was extremely well managed and that everything in the College was satisfactory. In his opinion, it was for the benefit of the country that the College should remain at Coopers Hill. Why on earth they should destroy a good College in order to set it up somewhere else passed his comprehension.

The Marquis of Bath said there was a good deal of misapprehension both with regard to the reasons which influenced the Secretary of State in Council in formulating the scheme and also as to the results which would ensue from it. There had grown up throughout the United Kingdom a number of excellent institutions which were fully capable of carrying out that engineering instruction which Coopers Hill was originally founded to establish—institutions whose diplomas and degrees the Indian Government were prepared to accept. Further, the establishment of a forestry school at that College was no part of the original scheme. He particularly emphasised the fact that the scheme was, and was

intended to be, of a temporary nature. (Hear, hear.) In coming to his decision the Secretary of State in Council was guided by very strong representations that were made to him by the experts whom he consulted. They represented that the number of men who were engaged in the study of forestry was very small—only ten a year. It was considered most necessary that they should continue to be educated all in one place, and that a residential University should be found which provided rooms and particularly supervision for the students, and where they could be brought into contact with their contemporaries who were themselves at the same time studying for professions and other walks of life. Another advantage that was desired was that forestry students should obtain the benefit of instruction in auxillary departments of science and have the opportunity of obtaining University degrees or diplomas. In searching for a University of a residential character, and one not too far from London, the choice naturally lay between Oxford and Cambridge. No idea of preferring the one University to the other ever entered the minds of the authorities of the India Office. Indeed, when attention was first directed to the matter some two years ago, Cambridge was thought likely to be the most suitable place for the forestry school. But the experts in Indian forestry urged upon the India Office that practical teaching in forestry, involving visits to woods, must go hand in hand with theoretical instruction, and they pointed out that the situation of Oxford with respect to woods was far more favourable than that of Cambridge. There seemed to be an idea abroad that admission to the forestry school at Oxford would be of the closest kind. As a matter of fact the competition would be just as open at Oxford as at Coopers Hill, and the examination would be carried out by the Civil Service Commissioners. The one thing that the India Office required was that the students should continue their training at the University for two years and spend the last year of the course in Germany. But he desired again to emphasise the fact that this was merely a temporary measure. The revenues of India would not be spent upon a permanent establishment at Oxford or anywhere else until the matter

had been fully considered in the light of experience and of the best expert opinion. If it would meet in any way the objections that were felt to the scheme, he could undertake that an inquiry, which should include outside authorities, would be held before the close of three years to consider and report upon the experiment. Moreover, if it should be thought well to do so, the India Office were prepared to reduce the proposed experimental term of five years to three years; but they felt they could not reduce it below the latter period with advantage to the experiment. He hoped that the interest which had been aroused in this question would result in the establishment of institutions which gave teaching in forestry.

Earl Spencer said the subject was one of considerable importance. If they were not to maintain with regard to this question of forestry the general rule which had been hitherto adopted that all places of education should be able to send up candidates for the great Civil Services, they would be creating a bad precedent. He himself spoke, not only as a Cambridge man, but also as representing other Universities, of one of which, a northern University, he had the honour to be Chancellor. He could not see that the noble Marquis, in his clear and able statement, had furnished any argument why this difference should be made with regard to forestry. As far as he could gather, the Coopers Hill School was being practically done away with because it was found that in many places of education all over the country admirable teaching was given in various things taught at Coopers Hill. He could not understand, however, why it was necessary to require that the pupil students in forestry should all be instructed by one teacher. He thought that what Lord Lytton had said was perfectly true, that if they once established this school at a particular University it would be exceedingly difficult to remove it (hear, hear), and therefore an injustice would be done to a great many places of education. He could not understand exactly the comparison between Oxford and Cambridge with regard to special advantages in this matter. Although not an Oxford man, he had frequently passed Oxford, and it had never occurred to him that it was situated in the centre

of a great forest, and Cambridge, like Oxford, had within easy reach very large woods—in Bedfordshire, and even Northamptonshire, for instance. Moreover, Cambridge University held its own for scientific teaching with any place of education. He hoped their Lordships would agree to the resolution, as it was of great importance that they should not give an advantage to one particular University over another. He sincerely hoped the Government would not commit them to the new principle adumbrated with regard to the Civil Service.

The Marquis of Lansdowne said there was always a certain amount of animated rivalry in these competitions, which he was happy to think was always of a friendly description. He trusted that in the kind of private war which was proceeding between Oxford and Cambridge for the possession of these forestry students the rivalry would continue to be friendly. He might reassure the noble Earl opposite on one or two points. He could not help thinking that the amount of resentment which they were told had been provoked by these proposals was of a somewhat exaggerated character. What, after all, was the case? Coopers Hill College, for reasons into which he would not enter, because the question was not now before the House, had been put an end to; and it became necessary to consider what was to be done with that small portion of Coopers Hill students who had hitherto attended there for the purpose of studying forestry. They must be sent somewhere, and on the whole the Indian authorities had come to the conclusion that the University of Oxford offered the greatest facilities for the purpose. One thing seemed to him obvious—namely that this small handful of students could not be scattered about over a number of different educational establishments. The study of forestry was a highly specialised study and could only be pursued at places where particular educational facilities were forthcoming. It was for the authorities to consider, and with a perfectly open mind, whether they should send these students to Oxford or Cambridge. He was given to understand that when the proposal was put before the University of Cambridge the University authorities themselves admitted they possessed no particular facilities

for encouraging the study of forestry. He did not understand that that was merely due to the fact, although it was a fact, that the neighbourhood of Cambridge did not abound in those woodlands which were supposed to be desirable for the purpose of practical study. The result was this, that it had been decided to send this little body of some 20 students to study for a two years' course at the University of Oxford. The noble Earl was horrified, because he thought this arrangement was a blow at the practice of open competition; he could reassure him on that point. These students would be allowed to come up from any school or college, and they would gain admission to this forestry class by open competition, and open competition only. It was suggested that this was a dangerous discrimination in favour of one University at the expense of another. But what was the financial magnitude of this tremendous innovation? The whole expense of these forestry classes was to be borne out of Indian funds, and the only new financial element introduced into the calculation was a modest grant of £200 a year to the professor of entomology for a special course to the forestry students. This was an experiment which was to be tried for three years, and if the result fell short of expectation the whole question would be reviewed and an effort would be made to find some better arrangement. In these circumstances it would be somewhat violent for the House to take it upon itself to record its solemn disapproval of the proposals of the Secretary of State.

Viscount Goschen said that the real difficulty was the smallness of the whole operation. If there were 50 or 60 students they could be divided amongst several Universities. It was desirable that these students should receive technical education at an early period of their careers, and by getting them together the necessity of duplicating the teaching establishment was avoided. The noble Earl proposed in effect that there should be no school of forestry at all, but that special studies should be relegated to the close of the full University course. The choice lay between keeping the school in one place and scattering the students so widely as to have no professorial teaching in forestry at any University

Cambridge was not proposing to appoint a special professor. The whole quarrel turned on the possession of some ten men a year. For the next three years there would be forestry teachers at Oxford, and the University would endow a professorship, connected with a kindred subject. Nothing could be more deplorable than that a feeling of jealousy or resentment between the two great Universities should be aroused over this small question. Coopers Hill contained some 50 students, 40 of them engineering and ten of them forestry students. Cambridge would naturally capture the greater number of the former. Oxford might well be permitted to capture the latter.

The Bishop of Bristol said that the question was much larger than a dispute for the possession of ten men a year. It meant that all forestry appointments in India would be filled by Oxford men, when Cambridge ought to have its full share.

The Earl of Lytton said that if Cambridge captured the engineering students it would be in the open market. The question was not one of ten students a year. In a few years the students would number 50 or 60 a year. The necessary technical instruction could be given just as easily in Cambridge as in Oxford. If money were to be spent on the scheme in Oxford, it was futile to describe it as temporary. A protected interest would arise.

The Government were defeated on a division.

COOPERS HILL COLLEGE.

A year or so ago a suggestion was made in the pages of the *Indian Forester** that Coopers Hill should be maintained if not on its present lines then as a Forestry College for the Empire as a whole at which students from the Colonies could be educated as foresters side by side with those required for the Indian Empire. The *Pioneer*† draws attention to a modification of these proposals which has appeared in the *Times*, the modification consisting in the maintenance of Coopers Hill as an Engineering College and

* Vol. XXIX, No. 9, 373.

† Allahabad *Pioneer*, April 5th, 1905.

the formation of an Imperial Forestry College for the training of Forest Officers from India and the Colonies.

Although the question brought forward recently by Lord Lytton, in the House of Lords, with reference to the closing of the Royal Indian Engineering College at Coopers Hill, affects directly only the teaching of forestry, the principle for which he contended, says the *Times* in its engineering supplement, has an important bearing upon the whole problem of the selection and training of engineers for Public Works. One of the chief reasons assigned by the Committee of 1893 for the disestablishment of Coopers Hill College was that the Universities and other institutions of the United Kingdom had so far developed that they were able to supply men who in point of general technical instruction are suitable candidates for entrance to the Public Works Department of India; and the inference from the report of that Committee was that a specialised College like that at Coopers Hill was thereby rendered unnecessary. The proposal now is to establish a special course for forestry students for India at Oxford, which implies the provision of increased grants and facilities at Oxford for the purpose. If, as was suggested by Lord Lytton, Cambridge should succeed in attracting the engineering students for Indian Public Works, special courses, it may fairly be assumed, would have to be established at Cambridge for survey work and for Indian accounts. In like manner, if London or Glasgow secured the prospective telegraph officers for the Indian Public Works Department, local provision would have to be made for specialised instruction in the erection of aerial telegraph systems, survey, testing routine, and accounts applicable to the Indian service.

It appears, therefore, that the original statement of the disestablishment Committee that the Universities and other institutions are able to provide the necessary general instruction and training, has to be supplemented by the fact that there is no College, other than Coopers Hill, which is fitted to impart to such candidates the special knowledge necessary to render them efficient engineers for the Indian Public Works Department. Instead of abolishing Coopers Hill, the principal

Engineering College of the Empire, it might be wiser to extend it so as to enable it to provide specialised engineers, not only for India, but for every part of His Majesty's domains, where required for the Civil Service. Similarly, instead of establishing a mere seminary of forestry at Oxford for the ten or twenty students to which Lord Lansdowne referred, forestry might fittingly be represented by an Imperial College, at Oxford or elsewhere, from which men could be drawn for the development of that neglected branch for service wherever they may be wanted in Great Britain, India, or the Colonies. Lord Lansdowne regarded it as obvious that forestry students intended for India could not be scattered over a number of educational establishments, and Lord Bath emphasised the necessity of educating them all in one place, both for purposes of supervision and for the advantages which students derive from association with contemporaries studying for professions and other walks of life. This is equally true for telegraph and engineer students, and it makes the case for the retention of Coopers Hill College, on the lines laid down by Lord Curzon, and in accordance with the unanimous approval of the Government of India, stronger than ever. This opinion was confirmed by Lord Thring, who observed that it was incomprehensible that a good college should be destroyed in order to set it up elsewhere.

APPOINTMENT OF AN INSPECTOR OF GOVERNMENT ELEPHANTS IN THE MADRAS FOREST DEPARTMENT.—From papers recently received we are glad to note that the Government of Madras have sanctioned the temporary appointment of a Veterinary Inspecting Officer for elephants and cattle to the Forest Department. This officer will be under the orders of the Conservator of Forests, Southern Circle, but his work will from time to time be supervised by the Civil Veterinary Department. He will supervise the management and treatment of new captures as well as of the trained elephants working in the Circle, and his services will also be utilised in the selection of the bullocks or other draught animals that may be purchased by the Forest

Department. Mr. Mascarenhas, Senior Lecturer in the Madras Veterinary College, has been recommended for the appointment.

CANALS AND THE FORMATION OF PLANTATIONS.—The Punjab Government, not a bit too soon, says the *Indian and Eastern Engineer*, are seriously considering the wholesale damage done by cutting down timber before the advance of the canal irrigation in the Punjab, and have suggested to the Government of India that irrigated plantations be formed in the new canal colonies on the model of those existing at Changa Manga.

DESTRUCTION OF KHAIR BARK BY MONKEYS DURING THE GREAT FROSTS.—We have received from Mr. E. R. Stevens, Deputy Conservator in charge of the Dehra Dun Division, the following interesting note:—"This year the upper branches and at times the stems of the khair (*Acacia catechu*) are being stripped of bark by monkeys; it is probable that their usual food stuff has been destroyed by the heavy frosts and they have been reduced to take a hint from the porcupine below. Damage of this kind by monkeys has not been noticed by me before."

EXPORT OF DEER HORNS FROM CEYLON.—The export of deer and sambhur horns from Colombo still flourishes. The agitation raised by the Ceylon Game Protection Society some years ago against the exportation of cut and wrenched horns as distinguished from shed horns—deer and sambhur being ruthlessly slaughtered by organised gangs of Moor hunters for the sake of the horns principally—resulted in a slight falling off in the exports of a few years ago, but the "industry" is still very much alive. We trust that the Ceylon Government will take steps to put an end to this state of things before the damage done becomes irremediable. We would suggest that statistics be called for showing the number or weight of horns exported annually. From these it would be possible to arrive at the annual figure of slaughter. A high *ad valorem* export duty would probably meet the case to a certain extent.

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

3rd November 1904.—No. 1245-259-7-F.—Mr. J. H. Lace, Conservator of Forests, 2nd grade, on return from the leave granted to him in the Notification of this Department No. 460-F., dated the 30th April 1903, is appointed to the charge of the Pegu Circle, Lower Burma, of which he relieved Mr. J. Copeland, officiating Conservator, 3rd grade, on the forenoon of the 28th October 1904. From the same date Mr. Copeland reverted to his substantive appointment of Deputy Conservator, 1st grade, Burma.

3rd November 1904.—No. 1248—213-4-F.—Mr. A. G. Hobart-Hampden, Conservator of Forests, on return from the privilege leave granted to him in the Notification of this Department No. 775-F., dated the 8th July 1904, resumed charge of the office of Conservator of Forests, School Circle, United Provinces, and is reappointed Director of the Imperial Forest School, Dehra Dun, on the afternoon of the 26th October 1904. From the same date Mr. H. Jackson reverted to his officiating appointment of Conservator of Forests, 3rd grade, and Deputy Director, and Mr. R. McIntosh to his appointment as Instructor, Imperial Forest School.

19th November 1904.—No. 1259-F.—Mr. H. A. Hoghton, Conservator of Forests, 3rd grade, on return from leave, is appointed to the charge of the Oudh Circle, United Provinces, of which he relieved Mr. C. E. Muriel, officiating Conservator, 3rd grade, on the forenoon of the 15th November 1904.

From the same date Mr. Muriel reverted to his substantive appointment of Deputy Conservator on the Burma List.

2.—MADRAS GAZETTE.

24th October 1904.—Extension of Leave.—The six weeks' privilege leave, from 20th September 1904, granted to Mr. M. S. Noronha, Forest Ranger, 2nd grade, North Coimbatore Division (*vide* Notification published on page 1359 of Part II of *Fort St. George Gazette*, dated 4th October 1904), is extended up to 19th December 1904 (inclusive).

8th November 1904—No. 383.—

(1) Mr. Charles Edward Brasier, Conservator of Forests, to be in charge of the Northern Circle, with effect from the date of his return from leave.

(2) Mr. Alfred Wyndham Lushington, to be District Forest Officer, North Coimbatore, on relief by Mr. Brasier.

Appointments and Reversions.

8th November 1904.—No. 384.—The following appointments and reversions are made :—

With effect from the date on which Mr. H. A. Gass returned to duty.—

(1) Mr. Charles Edward Brasier, to revert as Conservator of Forests, 3rd grade.

(2) Mr. Alfred Wyndham Lushington, to revert as Deputy Conservator of Forests, 1st grade.

(3) Mr. Ernest Radcliffe Murray, to revert as Deputy Conservator of Forests, 2nd grade.

(4) Mr. Arthur Bushe Jackson, to revert as Deputy Conservator of Forests, 3rd grade.

(5) Mr. Hugo Francis Andrew Wood, to revert as Deputy Conservator of Forests, 4th grade.

(6) Mr. Robert Daniel Richmond, to act as Assistant Conservator of Forests, 1st grade, *vice* Mr. C. B. Dawson, acting in the 4th grade of Deputy Conservators.

(7) Mr. John Sinclair Battie, to act as Deputy Conservator of Forests, 1st grade, *vice* Mr. H. J. A. Porter on leave, during the absence of Mr. F. A. Lodge on leave.

(8) Mr. Claude duPre Thornton, to act as Deputy Conservator of Forests, 2nd grade, during the absence of Mr. F. A. Lodge on leave.

(9) Mr. Stephen Cox, to act as Deputy Conservator of Forests, 3rd grade, *vice* No. (8).

(10) Mr. Bernard Henry Barlow Poole, to act as Deputy Conservator of Forests, 4th grade, *vice* No. (9).

(11) Mr. Cecil Barry Dawson, to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. H. J. A. Porter on furlough.

During the absence of Mr. C. E. Brasier on privilege leave.—

(12) Mr. Alfred Wyndham Lushington, to act as Conservator of Forests, 3rd grade.

(13) Mr. Ernest Radcliffe Murray, to act as Deputy Conservator of Forests, 1st grade.

(14) Mr. Arthur Bushe Jackson, to act as Deputy Conservator of Forests, 2nd grade.

(15) Mr. Hugo Francis Andrew Wood, to act as Deputy Conservator of Forests, 3rd grade.

3. — BOMBAY GAZETTE.

11th November 1904.—No. 2289.—Mr. R. H. Madan, Extra Deputy Conservator of Forests, 3rd grade, delivered over and Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, received charge of the office of the Divisional Forest Officer North Thana, on the 3rd November 1904, in the forenoon.

4.—BENGAL GAZETTE.

31st October 1904.—No. 3018 T. R.—Consequent on the services of Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade, having been placed at the disposal of the Government of India, with effect from the 5th September 1904, the following provisional substantive promotion is made with effect from the above date :—

Mr. T. H. Monteath, officiating Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade, provisional substantive.

4th November 1904.—No. 3128 T. R.—Mr. W. Breakey, Extra Assistant Conservator of Forests, substantive *pro tem*, temporarily attached to the Sundarbans Division, is re-transferred as an attached officer to the Singhbhum, with effect from the afternoon of the 9th October 1904.

12th November 1904.—No. 4065.—Mr. W. F. Lloyd, Deputy Conservator of Forests, is, on return from the combined leave granted to him in Notification No. 1278-For dated the 29th February 1904, posted to the charge of the Darjeeling Forest Division.

12th November 1904.—No. 4066.—Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, has been granted by His Majesty's Secretary of State for India an extension of six days' furlough, in continuation of the combined leave granted to him in Notification No. 1278-For., dated the 29th February 1904.

12th November 1904.—No. 4075.—Mr. W. R. LeG. Jacob, Assistant Conservator of Forests, attached to the Direction Division, is transferred to the Buxa Division, as an attached officer, with effect from the 13th November 1904.

16th November 1904.—No. 4151.—Consequent on the return of Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, from the combined leave granted in Notification No. 1278-For., dated 29th February 1904, the following reversions are ordered with effect from the 11th November 1904 :—

Mr. F. Trafford, officiating Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 4th grade.

Mr. J. L. Baker, Officiating Deputy Conservator of Forests, 4th grade, to be Assistant Conservator of Forests, 1st grade.

16th November 1904.—No. 4256. Mr. C. G. Rogers, Deputy Conservator of Forests, is granted combined leave for twenty-three months, with effect from the 15th November 1904, *vis.*, privilege leave for three months under Articles 246 and 260 of the Civil Service Regulations, and furlough for the remaining period under Articles 233 and 308 (b) of the Civil Service Regulations.

5. — UNITED PROVINCES GAZETTE.

17th November 1904.—No. 4576—II 448-1904.—Mr. H. G. Billson, Deputy Conservator of Forests, on return from leave, to the Kumaun Forest Division of the Central Circle.

17th November 1904.—No. 4577—II-448-1904.—Mr. B. A. Rebsch, Deputy Conservator of Forests, on being relieved, from the Kumaun to the Ganges Forest Division of the Central Circle.

17th November 1904.—No. 4578.—II-448-1904.—Mr. R. C. Milward, Deputy Conservator of Forests, on being relieved, from the Ganges to the Garhwal Forest Division of the Central Circle.

17th November 1904.—No. 4579—II-448-1904. Mr. E. A. Courthope, officiating Deputy Conservator of Forests, from the Janusar Division to the Direction Division, School Circle.

23rd November 1904.—No. 4564—II-665B-5.—Consequent on the reversion to British service of Pandit Keshore Nand, Extra Assistant Conservator of Forests, 2nd grade, Pandit Sada Nand Garola, Extra Assistant Conservator of Forests, 2nd grade, provisionally substantive, to revert as Extra Assistant Conservator of Forests, 3rd grade (seconded)

23rd November 1904.—No. 4674.—II-388-1904.—Mr. J. Whitehead, who has been appointed to the Forest Department by the Secretary of State for India, and who reported his arrival at Allahabad on the forenoon of the 23rd November 1904, to be Assistant Conservator of Forests, 2nd grade, and to be attached to the Kumaun Forest Division in the Central Circle.

28th November 1904.—No. 4729—II-6-1904.—The undermentioned officer has been granted, by His Majesty's Secretary of State for India, permission to return to duty:—
R. H. G. Bilson, Deputy Conservator of Forests.

6.—PUNJAB GAZETTE.

14th November 1904 No. 497 A.-L.—No. 14.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each.

Name.	Present grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. G. S. Hart ...	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 1st grade.	15th August 1904.	Consequent on Mr. H. A. Hoghton's appointment as Conservator.
Mr. A. M. F. Caccia	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.		
Mr. J. E. Barrett ...	Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 2nd grade.		
Punjab Pilot ...	Deputy Conservator, 4th grade.	Deputy Conservator, 3rd grade.		
Mr. S. L. Kenny ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.		
Mr. A. D. Blascheck	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.		
The Punjab Pilot's appointment having risen to Deputy Conservator, 3rd grade, substantively one appointment of 4th grade, Deputy Conservator, is abolished, and the number of appointments in the 4th grade, Deputy Conservators, is reduced from seven to six.				
Mr. H. E. Bartlett ...	Provisional Deputy Conservator, 3rd grade.	Provisional Deputy Conservator, 3rd grade, and officiating Deputy Conservator, 2nd grade.	20th August 1904.	Consequent on the departure of Mr. Caccia on three months' privilege leave.
Mr. S. L. Kenny ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A. D. Blascheck	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

14th November 1904.—No. 501.—*Promotions*.—His Honour the Lieutenant-Governor of the Punjab is pleased to order the following promotions amongst the Forest Officers of the Provincial Service, with effect from the 15th August 1904:—

Mr. C. F. Rossiter, Extra Deputy Conservator of Forests, 4th grade, to be Extra Deputy Conservator, 3rd grade.

Munshi Fazal Din (I), Khan Bahadur, Extra Assistant Conservator, 1st grade, and officiating Extra Deputy Conservator, 4th grade, to be Extra Deputy Conservator, 4th grade.

Lala Jowala Parshad, Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade, and officiating Extra Deputy Conservator, 4th grade.

7.—CENTRAL PROVINCES GAZETTE.

26th October 1904.—No. 83.—Lad Khan, officiating Deputy Ranger, 1st grade, Buldana Division, was on leave on medical certificate from the 22nd September to the 13th October 1904, both dates included.

2nd November 1904.—No. 6928.—Consequent on the deputation of Mr. R. M. Williamson, Deputy Conservator of Forests, 3rd grade, for employment in Rajputana, the following transfers are ordered:—

(1) Mr. C. A. Von B. Malcolm, Assistant Conservator of Forests, attached to the Ellichpur Forest Division, is appointed Personal Assistant to the Conservator of Forests, Berar Circle, and is attached to the Direction Division, Amraoti, until further orders.

(2) Rai Bahadur Mansukh Rai, Extra Deputy Conservator of Forests, in charge of the Direction Division, Amraoti, is appointed to hold charge of the Nagpur-Wardha Forest Division.

(3) On relief by Rai Bahadur Mansukh Rai, Mr. H. E. Bartlett, Deputy Conservator of Forests, in charge of the Nagpur-Wardha Forest Division, is transferred to the charge of the Ellichpur Forest Division.

2nd November 1904.—No. 89.—The following promotions are ordered with effect from the 1st November 1904:—

Name.	From	To	Vice
Thamansingh ...	Deputy Ranger, 2nd grade, offg.	Deputy Ranger 2nd grade.	In an existing vacancy.
Munirullah Khan	Deputy Ranger, 3rd grade	Deputy Ranger, 2nd grade, sub. <i>pro tem</i> .	Bhairaosingh, seconded
Fazal Azim ...	Ditto ..	Deputy Ranger, 2nd grade, offg.	Thamansingh, confirmed.

11th November 1904.—No. 7088.—Consequent on the deputation on Foreign Service of Mr. N. C. McLeod, Extra Assistant Conservator of Forests, 1st grade, Mr. R. C. Thompson, Extra Assistant Conservator of Forests, 2nd grade, is appointed to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem*, with effect from the 21st August 1904, but will remain seconded.

15th November 1904.—No. 97.—Sick leave on half pay on medical certificate for four months and fourteen days, under Article 336 of the Civil Service Regulations, is granted to Lad Khan, Deputy Ranger, 1st grade, Permanent Establishment, Buldana Division, with effect from the 6th November 1904, and in continuation thereof sick leave on quarter pay on medical certificate for six months under Article 340(a) of the Civil Service Regulations.

14th November 1904.—No. 7212.—On return from leave, Mr. Ramchandra Krishna, Extra Assistant Conservator of Forests, is re-posted to the Nimar Forest Division as an Assistant to the Divisional Forest Officer.

21st November 1904.—No. 68.—Privilege leave for two months and 23 days, under Article 260 of the Civil Service Regulations, is granted to Mr. N. S. Dhamdhare, Forest Ranger, 2nd grade, Permanent Establishment, Ellichpūr Division, with effect from the 21st November 1904, or such subsequent date as he may be permitted to avail himself of it.

22nd November 1904.—No. 7337.—On being relieved by Mr. A. M. F. Caccia, M.V.O., Deputy Conservator of Forests, of the charge of the Hoshangabad Forest Division, Mr. J. J. Hobday, Extra Assistant Conservator of Forests, is transferred to the charge of the Bhandara Forest Division.

On being relieved by Mr. J. J. Hobday, Mr. S. G. Pranjpe, Extra Assistant Conservator of Forests, is transferred to the charge of the Sambalpur Forest Division.

On being relieved by Mr. S. G. Pranjpe, Mr. Faiz Baksh, Extra Assistant Conservator of Forests, is transferred to the Balaghat Forest Division, and will remain attached to that Division.

8.—BURMA GAZETTE.

24th October 1904.—No. 26.—With reference to Revenue Department Notification No. 423 (Forests), dated the 24th September 1904, Mr. R. R. O'Hara, Extra Assistant Conservator of Forests, assumed charge of the North Tharrawaddy Sub-Division, relieving Maung Tha Kado, Extra Assistant Conservator of Forests, on the afternoon of the 19th October 1904.

27th October 1904.—No. 478.—Mr. S. Carr, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

30th October 1904.—No. 489.—Mr. G. R. Jeffery, Assistant Conservator of Forests, is transferred from the Myadaung Sub-Division, Katha Division, and is posted to duty in the Pinyinana Division.

3rd November 1904.—No. 27.—With reference to Revenue Department Notification No. 452 (Forests), dated, 13th October, 1904, Mr. A. Rodger, officiating Deputy Conservator of Forests, took over charge of the Working Plans Division, Thayetmyo, on the forenoon of the 25th October 1904.

3rd November 1904.—No. 28.—With reference to Revenue Department Notification No. 451 (Forests) dated the 13th October 1904, Mr. F. J. Branthwaite, Deputy Conservator of Forests, assumed charge of the Thayetmyo Division, on the forenoon of the 25th October 1904, relieving Mr. A. Rodger, officiating Deputy Conservator of Forests.

3rd November 1904.—No. 29.—With reference to Revenue Department Notification No. 424 (Forests), dated the 24th September 1904, Maung Tha Kado, Extra Assistant Conservator of Forests, assumed charge of the Nawin Forest Sub-Division on the forenoon of the 27th October 1904.

3rd November 1904.—No. 44.—With reference to Revenue Department Notification No. 449 (Forests), dated the 12th October 1904, Mr. H. C. Walker, officiating Deputy Conservator of Forests, assumed charge of the Working Plans in the Thaungyin Division, on the forenoon of the 13th October 1904.

5th November 1904.—No. 492.—On his return from leave Mr. S. Carr, Deputy Conservator of Forests, is posted to the charge of the Pinyinana Forest Division.

5th November 1904.—No. 493.—On relief by Mr. S. Carr, Deputy Conservator of Forests, Mr. T. W. Forster, Extra Assistant Conservator, is transferred from Pinyinana Forest Division to the charge of the Gangaw Sub-Division, Yaw Forest Division.

5th November 1904.—No. 494.—On relief by Mr. T. W. Forster, Extra Assistant Conservator, Mr. S. E. F. Jenkins, Extra Assistant Conservator, is transferred from the Gangaw Sub-Division, Yaw Forest Division, to the charge of the Bampon Sub-Division, Southern Shan States Forest Division.

7th November 1904.—No. 678.—Maung Ba O, Ranger, 3rd grade, is transferred from the Myitkyina Range, Myitkyina Division, and is appointed Assistant Manager, Rubber Plantation, Mergui, South Tenasserim Division.

7th November 1904.—No. 679.—On relief by Maung Ba O, Ranger, 3rd grade, Mr. A. S. Rencontre, Assistant Manager, Rubber Plantation, Mergui, is transferred to the Mergui Range, South Tenasserim Division.

7th November 1904.—No. 680.—On return from leave Mr. D. A. Allan, Ranger, 1st grade, is posted to the Myadaung Sub-Division, Katha Division.

7th November 1904.—No. 499.—Mr. S. F. Hopwood, Assistant Conservator of Forests, is transferred from Maymyo to Pyinmana, and is attached to the Pyinmana Forest Division.

8th November 1904.—No. 500.—Mr. J. Copeland, Deputy Conservator of Forests, on being relieved of the charge of the Pegu Circle, is posted to special duty in the Minbu Division.

9.—ASSAM GAZETTE.

31st October 1904.—No. 9375G.—The following is published :—

The undermentioned officer has been granted, by His Majesty's Secretary of State for India, permission to return to duty, as advised in list dated the 30th September 1904 :—

Name.	Service.	Appointment.	Date on which permitted to return.
Mr. E. M. Coventry	Deputy Conservator of Forests, Assam.	Within period of leave.

10.—MYSORE GAZETTE.

2nd November 1904.—No. R. 3873-Fl, 109-04-2.—Mr. B. Ramaswami Iyer, B.A., Assistant Conservator of Forests on leave, is posted to the Chitaldrug district as District Forest Officer, to join on the expiry of his leave or before it.

7th November 1904.—No. R. 3946-Fl, 109-04-3.—(1) Mr. Y. Sitaramayya, B.A., Assistant Conservator, in charge of the Hassan District Forest Office, will be on special duty for the examination and exploitation of the Ghat Forests of the Shimoga, Hassan and Kador districts, *vice* Mr. Narasimha Murthi Rao, deceased.

(2) Mr. K. Shamaingar, Assistant Conservator, is transferred from the Chitaldrug district to the Hassan district as District Forest Officer.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S WOOD CIRCULAR.

3rd November 1904.

EAST-INDIA TEAK.—The deliveries for October amount to 1,131 loads as compared with 1,214 loads for October last year, making the total deliveries for the ten months past 8,344 loads against 9,596 loads for the same ten months of 1903. For regular stock there has been some improvement in price in London during October, influenced by the very strong position ahead, disclosing a quite pitiful lack of supplies directly any demand is felt. Some small quantities sold in London by auction during the month, of irregular specification, were very much neglected by buyers, and went at prices out of all proportion to their intrinsic value.

ROSEWOOD—EAST INDIA.—Stocks are more than sufficient for the present limited demand, sales being slow and difficult.

SATINWOOD—EAST INDIA.—Sales have been encouraged by concessions in prices but nevertheless the quantity cleared is not large.

EBONY—EAST INDIA.—Is not asked for.

PRICE CURRENT.

Indian teak and logs, per load	...	...	£10 to £18-10s.
" " planks "	...	...	£13 " £20.
Rosewood, per ton	...	...	£5 " £12.
Satinwood , sq. ft.	...	...	7d. " 18d.
Ebony " ton	...	...	£5 " £10.

DENNY, MOTT AND DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 2nd November 1904.

TEAK—The landings in the docks in London during October consisted of 2 loads of logs and 200 loads of planks and scantlings, or a total of 202 loads, as against 1,472 loads for the corresponding month of last year. The deliveries into consumption were 641 loads of logs and 319 loads of planks and scantlings—together 960 loads, as against 811 loads for October 1903.

The dock stocks at date analyse as follows:—

	5,044 loads of logs, as against	6 666 loads at the same date last year.
	3,801 " planks "	3,856 " "
Total	8,845 loads	10,522 loads

The small arrivals of last month serve to show the low state of supplies at the shipping ports, and the increased consumption, especially in logs, has caused a further shrinkage in dock stocks. The deliveries, however, partly consisting as they do of shipments to the dockyards, do not necessarily show that there has been any improvement in the retail demand, which remains very quiet. The Admiralty requirements for next year, which have just been issued, show an increase on last year, and in view of the light supplies at the Burmese shipping ports, there will be a difficulty in supplying such demands in addition to the normal market requirements.

Business in October has shown an improved tone and more enquiry has been evident with increased confidence. The unfortunate Baltic Fleet incident last week caused a shock here and in Europe generally, which has, for the time being, unfortunately stopped the development of confidence; and until the incident is settled, business will probably remain in a nervous condition.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURIST.

1st November 1904.

Cardamoms	...	per lb.	1s. 3d. to 1s. 5d.
Croton seeds	...	" cwt.	20s. to 25s.
Cutch	...	" "	25s. to 35s.
Gum Arabic	...	" "	15s. to 20s.
Do. Kino	...	" lb.	2½d. to 4d.
India-rubber, Assam	...	" "	2s. 3d. to 3s. 6d.
Do. Burma	...	" "	2s. to 3s. 4½d.
Myrabolans, Madras	...	" cwt.	5s. to 6s. nom.
Do. Bombay	...	" "	4s. to 7s. 6d.
Do. Jubbulpore	...	" "	4s. to 6s. 9d.
Do. Bengal	...	" "	3s. 6d. to 6s. 4½d.
Nux vomica { Cochin	...	" "	8s. to 11s.
Nux vomica { Bengal	...	" "	8s. to 9s.
Oil, Lemon grass	...	" lb.	8d.
Orchella weed Ceylon	...	" cwt.	10s. to 12s. 6d.
Seedlac	...	" "	175s. to 200s.
Tamarinds, Calcutta	...	" "	7s. to 9s.
Do. Madras	...	" "	4s. 6d.

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

1st December 1904.—No. 1315-F.—The undermentioned officers, who have been appointed by His Majesty's Secretary of State to the Forest Department of India, are appointed to be Assistant Conservators, 2nd grade, with effect from the dates specified opposite their names, and are posted to the Provinces named below :—

Mr. J. D. Clifford, F. C. H., Burma, 14th November 1904.

Mr. J. Whitehead, United Provinces, 19th November 1904.

Mr. P. C. Corbould, Central Provinces 19th November 1904.

Mr. C. H. Philipp, Burma, 14th November 1904.

The Hon'ble J. W. Best, Central Provinces, 19th November 1904.

13th December 1904.—No. 1359 274-9-F.—The services of Mr. R. M. Williamson, Deputy Conservator of Forests, 3rd grade, Central Provinces, are placed at the disposal of the Foreign Department for a period of one year, with effect from the afternoon of the 21st November 1904, for employment in Bundelkhand, Central India.

2.—MADRAS GAZETTE.

14th November 1904.—*Leave*—M. R. Ry. V. P. Ramalingam Pillai, Forest Ranger, 2nd grade Tinnevely district, is granted privilege leave on medical certificate, under article 260 of the Civil Service Regulations, for two months from date of relief.

17th November 1904.—No. 391.—Mr. Henry Tireman, District Forest Officer, North Malabar, is granted combined privilege leave and furlough without medical certificate for two years with effect from the date of his relief.

17th November 1904.—No. 392.—Mr. Cecil Ernest Claude Fischer, Acting District Forest Officer, Ganjam, is granted combined privilege leave and furlough without medical certificate for thirteen months with effect from the date of his relief.

17th November 1904.—*Appointment*.—Bhide Dixit Chintaman, private student with Dehra Dun Ranger's certificate, is appointed sub. *pro tem*, 6th grade Ranger on Rs. 50 per mensem on probation for six months, *vice* Ranger Mr. P. Ananda Row on other duty and is posted to Kurnool west district. To join forthwith.

21st November 1904.—No. 395.—Mr. James Stewart Scot, to act as District Forest Officer, North Malabar, during the absence of Mr. H. Tireman on leave or until further orders.

21st November 1904. No. 401.—The following gentlemen, who have been appointed by the Right Honourable the Secretary of State for India as Assistant Conservators of Forests, 2nd grade, are posted to the districts mentioned below :—

(1) Mr. B. L. Seaton-Winton, to North Coimbatore to do duty under Mr. A. W. Lushington.

(2) Mr. B. F. Rigold, to South Salem to do duty under Mr. F. A. Lodge.

13th December 1904. No. 423.—Mr. Percy Manners Lushington, to be District Forest Officer, North Malabar, without prejudice to his duties as District Forest Officer, South Malabar.

13th December 1904. - No. 424. - Mr. James Stewart Scot, to be District Forest Officer, Kurnool East, on relief by Mr. P. M. Lushington.

13th December 1904.—No. 425.—Mr. Stephen Cox, to be District Forest Officer, Ganjam, on relief by Mr. J. S. Scot.

13th December 1904.—No. 426.—Mr. H. C. Bennett, who has been newly appointed by the Right Honourable the Secretary of State for India to be Assistant Conservator of Forests, 2nd grade, is posted to Bellary to do duty under Mr. F. C. L. Cowley-Brown.

20th December 1904 —No. 431.—Under article 260 of the Civil Service Regulations (4th edition), Mr. R. Ry. M. Rama Rao Avergal, District Forest Officer, North Salem, is granted privilege leave for three months from 4th January 1905.

3.—BOMBAY GAZETTE.

22nd November 1904.—No. 2545.—Messrs. A. G. Edie, Deputy Conservator of Forests, and D. N. Damle, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office Nasik, on the 20th October 1904, in the afternoon.

25th November 1904.—No. 6048.—Mr. D. A. Thomson Deputy Conservator of Forests, delivered over and Mr. O. H. L. Napier, Deputy Conservator of Forests, received, charge of the Belgaum Forest Division on the forenoon of the 19th instant.

30th November 1904.—No. 2429.—In exercise of the powers delegated to him under Government Resolution No. 289, dated 20th March 1889, the Conservator of Forests, N. C., has granted one month's privilege leave with effect from the 26th instant to Mr. G. S. Hinge, Extra Assistant Conservator of Forests 1st grade and Sub-Divisional Forest Officer, South Thana.

30th November 1904.—No. 2430.—Mr. G. S. Hinge, Extra Assistant Conservator of Forests, 1st grade delivered over, and Mr. R. H. Madan, Extra Deputy Conservator of Forests, 3rd grade, received, charge of the office of the Sub-Divisional Forest Officer, South Thana, on the 26th November 1904, in the forenoon.

30th November 1904.—No. 9233.—His Excellency the Governor in Council is pleased to transfer Mr. Krishnaji Balwant Gokhale, L. C. E., Extra Assistant Conservator of Forests, 4th grade, to the Northern Circle and place him under the orders of the Conservator of Forests, N. C.

6th December 1904.—No. 2704.—Messrs. D. N. Damle, Extra Assistant Conservator of Forests, and H. Murray, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Nasik, on the forenoon of the 23rd November 1904.

6th December 1904.—No. 9410.—Mr. F. Gleadow, Conservator of Forests, 3rd grade is allowed an extension by seven days of the furlough granted to him in Government Notifications No. 1856, dated 17th March 1903, and No. 6656 dated 31st August 1904.

6th December 1904.—No. 9411.—Mr. Metharam Deumal Jagtiani, Extra Assistant Conservator of Forests, 4th grade, and Sub-Divisional Forest Officer, Central Thana, is granted privilege leave of absence for three months.

6th December 1904.—No. 9412.—His Excellency the Governor in Council is pleased to appoint Mr. Sadashiv Pandurang Limaye to act as 4th grade Extra Assistant Conservator of Forests, Central Thana, during the absence on leave of Mr. Metharam Deumal Jagtiani, or pending further orders.

9th December 1904.—No. 9534.—Mr. Krishnaji Pandurang Joshi is allowed an extension by four days of the furlough granted to him in Government Notifications Nos. 2292, dated 1st April 1903, and 3707, dated 17th May 1904.

14th December 1904.—No. 6429.—Mr. P. E. Aitchison, Assistant Conservator of Forests, S. D., Kanara, who was deputed as a temporary measure to supervise timber works in N. D., Kanara, reported himself for duty to the Divisional Forest Officer there on the forenoon of the 1st November 1904.

4.—BENGAL GAZETTE.

30th November 1904.—No. 4463.—On relief by Mr. W. F. Lloyd, Deputy Conservator of Forests, Mr. H. King Robinson, Assistant Conservator of Forests, is granted twelve months' combined leave. *vis.*, privilege leave, under article 233 of the Civil Service Regulations, for two months and eleven days and furlough on medical certificate for the remaining period, under article 311 of the same Regulations, with effect from the 11th November 1904, or any subsequent date from which he may avail himself of it.

1st December 1904.—No. 4490.—Consequent on the services of Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade, having been placed at the disposal of the Government of India with effect from the 5th September 1904, the following provisional substantive promotions are made with effect from the above date:—

Mr. T. H. Monteath, Officiating Deputy Conservator of Forests, 4th grade, to be Deputy Conservator of Forests, 4th grade, provisional substantive.

Mr. H. K. Robinson, Officiating Assistant Conservator of Forests, 1st grade, to be Assistant Conservator of Forests, 1st grade, provisional substantive.

This cancels Notification No. 3018 T.R., dated the 31st October 1904.

5th December 1904.—No. 4556.—Consequent on the departure of Mr. C. G. Rogers, F. C. H., Deputy Conservator of Forests, 2nd grade, on the combined leave granted to him in Notification No. 4256 For., dated 16th November 1904, with effect from the 15th November 1904, the following temporary promotions are ordered from the above date :—

Tista Division.—Mr. H. H. Haines, F. C. H., Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Jalpaiguri Division.—Mr. F. Trafford, Deputy Conservator of Forests, 4th grade to officiate as Deputy Conservator of Forests, 3rd grade.

Direction Division.—Mr. J. L. Baker, Assistant Conservator of Forests, 1st grade, to officiate as Deputy Conservator of Forests, 4th grade.

16th December 1904.—No. 4812.—Mr. J. P. Haslett, Extra Assistant Conservator of Forests, in charge of the Palamau Forest Division, is granted privilege leave for one month, under articles 246 and 260 of the Civil Service Regulations, with effect from the 15th December 1904, or any subsequent date from which he may avail himself of it.

Babu Gokul Chandra Chatterjee, Forest Ranger, 1st grade, in charge of the Koderma Range, Palamau Division, is appointed to hold charge of the Palamau Division in addition to his own duties during the absence, on leave, of Mr. Haslett or until further orders.

22nd December 1904.—No. 4956.—In Government Notification No. 4556 For., dated the 5th December 1904, published at page 1781, Part I of the *Calcutta Gazette* of the 7th idem, regarding the acting promotions of certain Forest officers, substitute "16th November" for "15th November" as the date from which these promotions are to take effect.

5.—U. P. AND OUDH GAZETTE.

8th December 1904.—No. 1082 VII, 455 B.-26.—In supersession of this Department Notification No. 1069,—VII-455 B.-26 dated 1st December, 1904, the following gentlemen are declared to have passed the Departmental Examination of Junior Officers, held on the 25th October 1904, and following days in the subjects specified below :—

Forest Officers, Vernacular.—By the higher standard.—Mr. T. Carr, Forest Law Mr. F. Canning, Land Revenue systems Mr. R. St. G. Burke and Mr. F. Canning.

6.—PUNJAB GAZETTE.

8th December 1904.—No. 541.—Lala Mulraj, Extra Assistant Conservator of Forests, on being relieved of the charge of the Rawalpindi Forest Division on 21st November 1904, is temporarily attached to Chamba Forest Division.

28th December 1904.—No. 570.—Mr. B. O. Coventry, Deputy Conservator of Forests, on return from combined leave, landed at Bombay on the forenoon on the 11th November 1904, and took over charge of the Rawalpindi Division on the forenoon of 21st idem, relieving Lala Mul Raj, Extra Assistant Conservator of Forests,

7.—CENTRAL PROVINCES GAZETTE.

23rd November 1904.—No. 99.—Privilege leave for twelve days, under article 260 of the Civil Service Regulations, is granted to Deputy Ranger Ganesh Dhonda, Permanent Establishment of Elichpur Division, with effect from the 9th to the 20th October 1904.

28th November 1904.—No. 7484.—Mr. James Donald, Assistant Conservator of Forests, attached to the Direction Division, is transferred to the Bilaspur Forest Division and is attached to that Division for the purpose of preparing a working-plan in the Lormi Range.

2nd December 1904.—No. 7622.—Consequent on the deputation on Foreign Service of Mr. N. C. McLeod, Extra Assistant Conservator of Forests, 1st grade, the following promotions are ordered with effect from the 21st August 1904 :—

- (1) Mr. R. C. Thompson, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem.*, but will remain seconded.

- (2) Mr. Srinivasulu Naidu, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade, sub. *pro tem*.
- (3) Mr. S. R. Parsons, Extra Assistant Conservator of Forests, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, sub. *pro tem*.
- (4) Mr. A. L. Chatterji, Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem*, to be Extra Assistant Conservator of Forests, 3rd grade, sub. *pro tem*.
- (5) Mr. Dhanji Shah N. Avasia, Ranger, 1st grade, to be Extra Assistant Conservator of Forests, 4th grade, sub. *pro tem*.

Orders No. 6615, dated the 21st October 1904, and No. 7088, dated the 11th November 1904, are hereby cancelled.

5th December 1904.—No. 7673.—The Hon'ble James W. Best, Assistant Conservator of Forests, 2nd grade, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Service, is posted to the South Chanda Division of the Southern Circle, Central Provinces.

Mr. Best reported his arrival at Bombay on the forenoon of the 19th November 1904, and at Nagpur on the forenoon of the 21st November 1904.

14th December 1904.—No. 7900.—Mr. P. S. Corbould, Assistant Conservator of Forests, 2nd grade, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Service is posted to the Direction Division of the Northern Circle, Central Provinces. Mr. Corbould reported his arrival at Bombay on the forenoon of the 19th November 1904, and at Jubbulpore on the forenoon of the 23rd November 1904.

22nd December 1904.—No. 8167.—With reference to Order No. 6312, dated the 11th October 1904, Mr. A. Hunt, Extra Assistant Conservator of Forests, attached to the Balaghat Forest Division, was relieved of his duties in that Division on the afternoon of the 11th October 1904.

Mr. Ganga Parshad Khetri, Extra Assistant Conservator of Forests, on relief of the charge of the Betul Forest Division, joined the Balaghat Forest Division, on the afternoon of the 31st October 1904 and will remain attached to that Division.

8.—BURMA GAZETTE.

10th November 1904.—No. 20.—Mr. A. Lawrence, Officiating Deputy Conservator of Forests, made over, and Mr. F. H. Todd, Deputy Conservator of Forests, received, charge of the Yaw Forest Division on the forenoon of the 26th October 1904.

12th November 1904.—No. 509.—On return from leave, Mr. F. H. Todd, Deputy Conservator of Forests, is posted to the charge of the Yaw Forest Division, *vice* Mr. A. Lawrence, Officiating Deputy Conservator of Forests.

12th November 1904.—No. 510.—On relief by Mr. Todd, Mr. A. Lawrence, Officiating Deputy Conservator of Forests, is attached to the Yaw Forest Division, as a temporary measure.

12th November 1904.—No. 513.—Mr. G. R. Jeffery, Assistant Conservator of Forests, is transferred from the Myadaung Sub-Division, Katha Division, and is posted to the Gangaw Sub-Division Yaw Forest Division.

This Department Notifications Nos. 489, dated the 30th October 1904, and 493, dated the 5th November 1904, are hereby cancelled.

18th November 1904.—No. 527.—Mr. James Douglas Clifford, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 14th November 1904, before noon.

Mr. Clifford is posted to the headquarters of the Prome Forest Division of the Pegu Circle.

18th November 1904.—No. 529.—Mr. Charles Henry Philipp, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, 2nd grade, reported his arrival in Rangoon on the 14th November 1904, before noon.

Mr. Philipp is posted to the headquarters of the Upper Chindwin Forest Division of the Northern Circle.

21st November 1904.—No. 541.—Mr. H. C. Walker, Officiating Deputy Conservator of Forests, was placed on special duty in the office of the Conservator of Forests, Tenasserim Circle, from the 22nd September 1904 to the 12th October 1904.

21st November.—No. 555.—The following alterations in rank are ordered in the Forest Department, with effect from the 7th September 1904, consequent on the return from leave of Mr. W. F. L. Tottenham, Deputy Conservator, 3rd grade :

Mr. W. F. L. Tottenham, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. H. Forteath, Deputy Conservator, 3rd grade, Officiating Deputy Conservator, 2nd grade, to revert to his substantive appointment.

Mr. C. B. Smales, Deputy Conservator, 3rd grade, *prov. sub.*, to revert to Deputy Conservator, 4th grade.

Mr. H. W. A. Watson, Deputy Conservator, 4th grade, *prov. sub.*, Officiating Deputy Conservator, 3rd grade, to revert to Assistant Conservator, 1st grade, and to officiate as Deputy Conservator, 4th grade.

Mr. R. E. Marsden, Assistant Conservator, 1st grade, *prov. sub.*, Officiating Deputy Conservator, 4th grade, to revert to Assistant Conservator, 2nd grade, and to continue to officiate as Deputy Conservator, 4th grade.

13th December 1904.—No. 559.—The following alterations in rank are ordered in the Forest Department, with effect from the 18th September 1904, consequent on the retirement of Mr. A. Weston, Deputy Conservator, 1st grade.

Mr. C. E. Muriel, Deputy Conservator, 2nd grade, to be Deputy Conservator, 1st grade.

Mr. H. Carter, Deputy Conservator, 2nd grade, *prov. sub.*, to be Deputy Conservator, 2nd grade.

Mr. W. F. L. Tottenham, Deputy Conservator, 3rd grade, to be Deputy Conservator, 2nd grade, *prov. sub.*

23rd November 1904.—No. 31.—With reference to Revenue Department Notification No. 500 (Forests), dated the 8th November 1904, Mr. J. Copeland, Deputy Conservator of Forests, assumed charge of his special duties in the Minbu Division, on the forenoon of the 4th November 1904.

23rd November 1904.—No. 32.—With reference to Revenue Department Notifications Nos. 466 and 467 (Forests), dated the 19th October 1904, Messrs. R. E. Marsden and L. C. Davis, Assistant Conservators of Forests, relinquished charge of their duties in the Yaw Division, on the afternoon of the 5th November 1904.

23rd November 1904.—No. 247.—At the Departmental Examination held at Rangoon on the 7th November 1904, the following candidates passed the examination in Burmese by the standards specified :—

H. S.—Mr. J. C. Hopwood, I. F. S. ; L. S.—Mr. J. Martini, Forest Ranger.

25th November 1904.—No. 33.—With reference to Revenue Department No. 499 (Forests), dated the 7th November 1904, Mr. S. F. Hopwood, Assistant Conservator of Forests, relinquished charge of his duties as Personal Assistant to the Conservator of Forests, Southern Circle, on the forenoon of the 21st October 1904.

28th November 1904.—No. 549.—Mr. C. E. Muriel, Deputy Conservator of Forests, is granted privilege leave for twenty-five days, with effect from the date on which he is relieved of the charge of the Oudh Circle, United Provinces.

28th November 1904.—No. 550.—On his return from leave Mr. C. E. Muriel, Deputy Conservator of Forests, is posted to the charge of the Pyinmana Forest Division.

28th November 1904.—No. 551.—On his return from leave Mr. S. Carr, Deputy Conservator of Forests, is posted to the charge of the Yaw Forest Division.

This Department Notification No. 492 (Forests), dated the 5th November 1904, is hereby cancelled.

28th November 1904.—No. 552.—On relief by Mr. S. Carr, Deputy Conservator of Forests, Mr. A. Lawrence, Officiating Deputy Conservator of Forests, is posted to the charge of the Katha Forest Division.

28th November 1904.—No. 553.—Mr. A. Lawrence, Officiating Deputy Conservator of Forests, Yaw Forest Division, is posted, as a temporary measure, to the charge of the Yaw Forest Division, *vice* Mr. F. H. Todd, Deputy Conservator of Forests, posted for temporary employment in the Andamans Forest Department.

29th November 1904.—No. 34.—Mr. F. H. Todd, Deputy Conservator of Forests, made over, and Mr. A. Lawrence, Officiating Deputy Conservator of Forests, received, charge of the Yaw Forest Division, on the afternoon of the 23rd November 1904.

30th November 1904.—No. 576.—Under the provisions of articles 246 and 260 of the Civil Service Regulations, Mr. W. J. G. Cooper, Extra Assistant Conservator of

Forests, is granted privilege leave for three months with effect from the date on which he relinquished charge of his duties in the Toungoo Forest Division.

This Department Notification No. 447, dated the 12th October 1904, is hereby cancelled.

30th November 1904.—No. 577.—The Lieutenant-Governor is pleased to empower Conservators of Forests in Burma, to sanction in accordance with the provisions of section 197 of the Code of Criminal Procedure (Act V of 1898), the prosecution of Rangers and Deputy Rangers.

1st December 1904.—No. 15.—With reference to Revenue Department Notification No. 467 (Forests), dated the 19th October 1904, Mr. L. C. Davis, Officiating Deputy Conservator of Forests, assumed charge of the Working Plans duty in the Upper Chindwin Division, on the 10th November 1904.

1st December 1904.—No. 16.—With reference to Revenue Department Notification No. 529 (Forests), dated the 18th November 1904, Mr. Charles Henry Phillip, Assistant Conservator of Forests, reported himself for duty in the Upper Chindwin Division, on the afternoon of the 25th November 1904.

2nd December 1904.—No. 265.—At the Departmental Examination held at Rangoon and Mandalay on the 8th and 9th November 1904, the following Officers passed the examination in the subject specified:—

Proced. and Acts.—Mr. S. F. Hopwood, I. F. S., and Mr. F. W. Collings, I. F. S.

9th December 1904.—No. 588.—The following alterations in rank are ordered in the Forest Department:—

- (1) With effect from the 18th September 1904, consequent on the retirement of Mr. A. Weston, Deputy Conservator, 1st grade—

Mr. H. Carter, Deputy Conservator, 2nd grade, to officiate as Deputy Conservator, 1st grade,

Mr. H. H. Forteath, Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 2nd grade.

Mr. H. W. A. Watson Assistant Conservator, 1st grade, Officiating Deputy Conservator, 4th grade, to officiate as Deputy Conservator, 3rd grade.

- (2) With effect from the 25th October 1904, consequent on the return from leave of Mr. F. J. Branthwaite, Deputy Conservator, 2nd grade, *prov. sub.*—

Mr. H. H. Forteath, Deputy Conservator, 3rd grade Officiating Deputy Conservator, 2nd grade, to revert to his substantive appointment.

Mr. H. W. A. Watson, Assistant Conservator, 1st grade, Officiating Deputy Conservator, 3rd grade, to officiate as Deputy Conservator, 4th grade.

- (3) With effect from the 26th October 1904, consequent on the return from leave of Mr. F. H. Todd, Deputy Conservator, 4th grade, *prov. sub.*—

Mr. G. R. Jeffery, Assistant Conservator, 2nd grade, *prov. sub.* (Officiating Deputy Conservator, 4th grade), to officiate as Assistant Conservator, 1st grade.

- 4) With effect from the 28th October 1904, consequent on the reversion of Mr. J. Copeland, Deputy Conservator, 1st grade, to his substantive appointment.—

Mr. H. Carter, Deputy Conservator, 2nd grade, Officiating Deputy Conservator, 1st grade, to revert to his substantive appointment.

Mr. J. Messer, Deputy Conservator, 3rd grade. Officiating Deputy Conservator, 2nd grade, to revert to his substantive appointment.

Mr. R. S. Troup, Deputy Conservator, 4th grade, Officiating Deputy Conservator, 3rd grade, to revert to his substantive appointment.

Mr. R. E. Marsden, Assistant Conservator, 2nd grade, Officiating Deputy Conservator, 4th grade, to officiate as Assistant Conservator, 1st grade.

9th December 1904.—No. 589.—Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, was placed on special duty in the Tharrawaddy Forest Division from the 26th to the 29th June 1904.

9th December 1904.—No. 590.—Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, was placed on special duty in the Mandalay Depot Forest Division from the 10th to the 15th November 1904.

9th December 1904.—No. 45.—With reference to Revenue Department Notification No. 576 (Forests), dated the 30th November 1904. Mr. W. G. Cooper, Extra Assistant Conservator of Forests, availed himself of the three months' privilege leave on the afternoon of the 30th November 1904.

9th December 1904.—No. 17.—With reference to Appointment Department Notification No. 466 (Forests), dated the 19th October 1904, Mr. R. E. Marsden, Officiating Deputy Conservator of Forests, assumed charge of the Working Plans duty in the Myittha Division on the afternoon of the 10th November 1904.

10th December 1904.—No. 31.—With reference to Revenue Department Notification No. 527 (Forests), dated the 18th November 1904, Mr. J. D. Clifford, Assistant Conservator of Forests, reported his arrival at Prome on the forenoon of the 20th November 1904.

12th December 1904.—No. 18.—With reference to Revenue Department Notification No. 678 (Forests), dated the 7th November 1904. Maung Ba O. Ranger, was relieved of his duties in the Myitkyina Division on the afternoon of the 6th December 1904.

13th December 1904.—No. 503.—The following alterations in rank are ordered in the Provincial Forest Service :—

- (1) With effect from the 14th September 1904, consequent on the deputation of Mr. S. A. Wood, Extra Assistant Conservator, 2nd grade, for service under the Soudan Government—

Mr. R. R. O'Hara, Extra Assistant Conservator 3rd grade, to be Extra Assistant Conservator, 2nd grade, *prov. sub.*

Mr. W. R. French, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade, *prov. sub.*

Mr. D. A. Allen, Ranger, 1st grade, to be Extra Assistant Conservator, 4th grade, *prov. sub.*

- (2) With effect from the 18th September 1904, consequent on the retirement of Mr. A. Weston, Deputy Conservator, 1st grade, and the transfer of an appointment to the provincial service—

Mr. R. M. Kavanagh, Extra Deputy Conservator, 4th grade, to be Extra Deputy, Conservator, 3rd grade.

Mr. D. H. Allan, Extra Assistant Conservator, 1st grade, to be Extra Deputy Conservator, 4th grade.

Mr. T. W. Forester Extra Assistant Conservator, 2nd grade, to be Extra Assistant Conservator, 1st grade.

Mr. R. K. O'Hara, Extra Assistant Conservator, 2nd grade, *prov. sub.*, to be confirmed in that grade.

Mr. G. T. Wrafter, Extra Assistant Conservator, 3rd grade, to be Extra Assistant Conservator, 2nd grade, *prov. sub.*

Mr. W. R. French, Extra Assistant Conservator, 3rd grade, *prov. sub.*, to be confirmed in that grade.

Mr. A. S. Rencontre, Extra Assistant Conservator, 4th grade, to be Extra Assistant Conservator, 3rd grade, *prov. sub.*

Mr. D. A. Allan, Extra Assistant Conservator, 4th grade, *prov. sub.*, to be confirmed in that grade.

Mr. J. D. Hamilton, Ranger, 2nd grade, to be Extra Assistant Conservator, 4th grade, *prov. sub.*

21st December 1904.—No. 280.—At the Departmental Examination held at Bassein, Akyab, Moulmein, Mergui, Minbu, Meiktila, Mandalay, Mogok, Kindat and Falam on the 7th, 8th and 9th November 1904, the following officer passed the examination in Burmese by the lower standard with great credit: Mr. C. H. Hearsey, Forest Ranger.

21st December 1904.—No. 19.—With reference to Revenue Department Notification No. 552 (Forests), dated the 28th November 1904, Mr. A. Lawrence, Officiating Deputy Conservator of Forests, assumed charge of the Katha Forest division on the forenoon of the 19th December 1904.

22nd December 1904.—No. 20.—With reference to Revenue Department Notification No. 680 (Forests), dated the 7th November 1904, Mr. D. A. Allan, Extra Assistant Conservator of Forests, reported himself for duty in the Katha division, on the forenoon of the 6th December 1904 and assumed charge of the Myadaung sub-division on the afternoon of the 8th idem.

9.—ASSAM GAZETTE.

29th November 1904.—No. 10120G.—Mr. G. M. Townshend, Assistant Conservator of Forests, attached to the Kamrup Forest Division, is transferred and attached to the Goalpara Forest Division.

5th December 1904.—No. 10267G.—In consequence of the return to duty of Mr. E. M. Coventry, Officiating Deputy Conservator of Forests, 2nd grade, the following reversions are made with effect from the 1st November 1904:—

Mr. W. F. Perré, Officiating Deputy Conservator of Forests, 2nd grade, to officiate as Deputy Conservator of Forests, 3rd grade.

Mr. A. R. Dicks and Mr. W. A. R. Doxat, Officiating Deputy Conservators of Forests, 3rd grade, on leave to revert to their substantive appointments of Deputy Conservators of Forests, 4th grade.

Mr. F. H. Cavendish, Officiating Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 4th grade.

22nd December 1904.—No. 10694G.—The following is published:—

The undermentioned officer has been granted by His Majesty's Secretary of State for India permission to return to duty, as advised in list, dated the 25th November 1904:—

Mr. A. R. Dicks, Deputy Conservator of Forests, within period of leave.

10.—MYSORE GAZETTE.

6th December 1904.—No. R. 4979—Ft. 20-04-8.—Mr. M. Srinivasa Rao, Sub-Assistant Conservator of Forests, who in Government Notification No. R. 1694—Ft. 20-04-5, dated the 26th August 1904, was posted to the Mysore District for duty under the District Forest Officer, is posted to the Shimoga District for the selection of areas for reservation, their preliminary demarcation and the preparation of maps and draft notifications under section 4 of the Mysore Forest Regulations.

15th December 1904.—No. R. 5266—Ft. 105-04-3.—The following promotions are ordered with effect from the 1st December 1904:—

1. Mr. G. Krishnamurti Naidu, Ranger of the first class, to be Sub-Assistant Conservator of Forests.
2. Mr. P. S. Govinda Rao, Ranger of the 2nd class, to be Sub-Assistant Conservator of Forests.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S WOOD CIRCULAR.

5th November 1904.

EAST INDIA TEAK.—The deliveries for November are normal, say 1,121 loads against 1,176 loads in November last year. For the eleven months the figures are 9,465 loads against 10,772 loads in the same period of 1903. There has been no change in prices to record in London.

ROSEWOOD.—EAST INDIA.—The demand continues dull, and sales are not easily made, therefore stocks should not be increased.

SATINWOOD.—EAST INDIA.—The demand is dull and sales quite of a retail character.

EBONY.—EAST INDIA.—Is not enquired for.

PRICE CURRENT.

Indian teak, log, per load	...	...	...	£10 to £18-10s.
" " planks "	...	...	...	£13 to £20.
Rosewood, per ton	...	...	...	£5 to £12.
Satinwood " sq ft.	...	...	...	7d. to 18d.
Ebony " ton	...	...	...	£5 to £10.

DENNY, MOIT AND DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st December 1904.

TEAK.—The landings in the docks in London during November consisted of 966 loads of logs and 167 loads of planks and scantlings, or a total of 1,133 loads, as against 1,455 loads for the corresponding month of last year. The deliveries into consumption were 614 loads of logs and 480 loads of planks and scantlings—together 1,094 loads, as against 1,181 loads for November 1903.

The dock stocks at date analyse as follows:—

	5,396 loads of logs, as against 6,967 loads at the same date last year.			
	3,488 „ planks „ 3,829 „ „			
Total	8,884 loads	„	10,796 loads	„ „

As shown by the above figures, the consumption continues to be very moderate. The log position is, however, very strong—seeing that the stocks of Rangoon, Moulmein and Bangkok wood are reduced to 3,742 loads, of which a large proportion consists of short-length timber. The dock figures show 1,654 loads of Java logs but these contain a large proportion of very small lengths, and the quality of the timber does not find favour for rolling-stock and shipbuilding purposes. The needs of H. M. Admiralty threaten to absorb most of the first-class Burma wood which can come forward next year, whilst stocks at the outports and in consumers' yards have run very low. Prices, therefore, are likely to rise still further, whilst business will remain difficult and restricted all round. The price of planks should strengthen with that of logs, but it must be borne in mind that teak is not a necessity in the rolling-stock and house-building industries, which are the main outlets for planks and conversions.

The general tone of the timber trade during November has been one of increasing assurance that both prices and imports have soundly adjusted themselves to the restricted trade which has marked all this year, and therefore that the all-round improvement which follows a widened outlet may fairly be counted on as the next phase of the market, although such widening out of the demand for consumption may yet be far off.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURIST.

1st December 1904.

Cardamoms	...	...	per lb.	1s. 3d. to 2s. 3d.
Croton seeds	...	...	„ cwt.	20s. to 25s.
Cutch	...	...	„ „	25s. to 35s.
Gum Arabic	...	...	„ „	15s. to 20s.
Do. Kino	...	...	„ lb.	4d. to 5½d.
India-rubber, Assam	...	...	„ „	7s. 6d. to 3s. 7½d.
Do. Burma	...	...	„ „	2s. to 3s. 4½d.
Myrabolans, Madras	...	...	„ cwt.	5s. to 6s.
Do. Bombay	...	...	„ „	4s. 3d. to 7s. 6d.
Do. Jubulpore	...	...	„ „	4s. to 6s. 9d.
Do. Bengal	...	...	„ „	3s. 6d. to 6s. 4½d.
Nux vomica { Cochin	...	...	„ „	12s. to 15s.
Nux vomica { Bengal	...	...	„ „	10s. to 11s.
Oil, Lemon grass	...	...	„ „	7½d.
Orchella weed, Ceylon	...	...	„ „	10s. to 12s. 6d.
Seedlac	...	...	„ „	175s. to 200s.
Tamarinds, Calcutta	...	...	„ „	7s. to 8s.
Do. Madras	...	...	„ „	4s. 6d.

EXTRACTS FROM OFFICIAL GAZETTES.

1.—GAZETTE OF INDIA.

4th January 1905.—No. 9—259-F.—Mr. E. E. Fernandez, Conservator of Forests, 1st grade, Central Provinces, is permitted to retire from the service of Government, with effect from the afternoon of the 11th November 1904.

From the same date the following promotions are made:—

Mr. A. M. Reuther, Conservator, 2nd grade, on return from the leave granted to him in the Notification of this Department, No 577-F., dated the 29th May 1903, is appointed to be Conservator, 1st grade, and is posted to the charge of the Berar Forest Circle, Central Provinces.

Mr. A. G. Hobart Hampden, Conservator, 3rd (officiating 2nd) grade, United Provinces, is confirmed in the latter grade.

Mr. A. F. Graddon, officiating Conservator, 3rd grade, Central Provinces, is confirmed in that class and grade.

2.—MADRAS GAZETTE.

3rd January 1905.—No. 2.—M. R. Ry. Tummaji Rao Babu Rao Avargal, Extra Assistant Conservator of Forests to act as District Forest Officer, North Salem, during the absence of M. R. Ry. M. Rama Rao Avargal on leave, or until further orders.

10th January 1905.—No. 12.—Mr. Frank Adrian Lodge, to act as Deputy Conservator of Forests, 1st grade, with effect from the date of his return from leave, during the absence of Mr. H. J. A. Porter on furlough.

No. 13.—Mr. William Aitchison, to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. H. Tireman on leave, until the date of Mr. F. A. Lodge's return from leave.

No. 14.—Mr. Bernard Henry Barlow-Poole, to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. H. Tireman on leave, from the date of Mr. F. A. Lodge's return from leave.

No. 15.—Mr. William Aitchison, to act as Deputy Conservator of Forests, 4th grade, during the absence of Mr. C. E. C. Fischer on leave.

3.—BOMBAY GAZETTE.

23rd December 1904.—No. 2614.—Mr. D. M. Bijoor, Extra Assistant Conservator of Forests, 2nd grade, delivered over, and Mr. W. F. D. Fisher, Deputy Conservator of Forests, 3rd grade, received charge of the office of the Sub-Divisional Forest Officer, North Thana, on the 12th December 1904, in the afternoon.

9th January 1905.—No. 2685.—Mr. Metharam Deumal Jagtiani, Extra Assistant Conservator of Forests, 4th grade, delivered over, and Mr. Sadashive Pandurang Limaye, acting Extra Assistant Conservator of Forests, 4th grade, received charge of the office of Sub-Divisional Forest Officer, Central Thana, on the 19th December 1904, in the afternoon.

10th January 1905.—No. 6945.—Mr. K. B. Gokhale, Extra Assistant Conservator of Forests, delivered over, and Mr. W. E. Copleston, Deputy Conservator of Forests, received charge of the office of the Sub-Divisional Forest Officer, Southern Division, Kanara, on the afternoon of the 20th December 1904.

11th January 1905.—No. 232.—Mr. H. W. Keys, Deputy Conservator of Forests, 2nd grade, and Divisional Forest Officer, Satara, is allowed such privilege leave as may be due to him on 25th February 1905, in combination with furlough for such period as may bring the combined period of absence up to one year.

12th January 1905.—No. 2722.—Mr. K. B. Gokhale, Extra Assistant Conservator of Forests, 4th grade, having been transferred to the Northern Circle from Southern Circle, reported himself on the 4th of January 1905, in the forenoon, for duty as Sub-Divisional Forest Officer, and has been posted to the Working Plans Division, Northern Circle.

4.—BENGAL GAZETTE.

14th January 1905.—No. 263 F.—*Notifications*.—Mr. W. M. Green Deputy Conservator of Forests, in charge of the Kurseong Division, is granted combined leave for 21 months, *vis.*, privilege leave for three months and furlough for the remaining period, under articles 233 and 308 (b) of the Civil Service Regulations, with effect from the 9th February 1905, or from such subsequent date as he may avail himself of it.

Mr. J. L. Baker, officiating Deputy Conservator of Forests, in charge of the Direction Division and Personal Assistant to the Conservator of Forests, Bengal, is placed in charge of the Kurseong Division, in addition to his other duties, during the absence, on leave, of Mr. Green, or until further orders.

16th January 1905.—No. 352 A — *Notifications* The Report of the Central Examination Committee having been received, the result of the second Half-yearly Departmental Examination of Assistant Magistrates and others, held on the 10th November 1904 and the two following days, is published for general information :—

III. — *Forest Officers* — The officers named below have passed in the subject or subjects mentioned against their names :—

- | | | | |
|-----------------------|-----|-----|---|
| 1. Mr. P. Tinne | ... | ... | Land Revenue Systems, and Procedure and Accounts. |
| 2. " W. R. LeG. Jacob | ... | ... | Procedure and Accounts. |
| 3. " T J. Pocock | ... | ... | Bengali, Higher Standard. |

5. - UNITED PROVINCES GAZETTE.

18th January 1905.—No. 219—II-39-1905.—Mr. J. Whitehead, Assistant Conservator of Forests, from the Kumaon Forest Division, Central Circle, transferred to the Kheri Forest Division, Oudh Circle.

6.—PUNJAB GAZETTE.

6th January 1905.—No. 5.—A. L. No. 1.—*Notification*.—Mr. A. J. Gibson, Deputy Conservator of Forests, on the completion of his field work in connection with the Working Plan in the Bashahr Division, on the forenoon of 12th December, was transferred to the Lahore Division, and took over charge of that Division, on the afternoon of that date, relieving Pandit Thakur Das, Extra Assistant Conservator of Forests, transferred to the Montgomery Division.

23rd January 1905.—No. 25.—*Notification*.—Lala Jowala Prashad and Pandit Thakur Das, Extra Assistant Conservators of Forests, respectively, made over and received charge of the Montgomery Division, on the afternoon of the 19th December 1904, consequent on the former's retirement from service from the same date.

7.—CENTRAL PROVINCES GAZETTE.

23rd December 1904.—No. 6.—The undermentioned officers, who were appointed in Departmental Order No. 2, dated the 6th May 1904, as probationary Forest Rangers, 6th grade, on Rs. 50 per mensem each, are confirmed in their appointments, with effect from the 1st April 1904 :—

1. Shridhar Jageshwar Chate.
2. Narhar Waman Joshi.

2nd January 1905.—No. 170.—Ranger Sitaram, who was appointed on probation as Ranger, 6th grade, by Departmental Order No. 217 of the 24th March 1904, is hereby confirmed in his present grade, with effect from the 1st December 1904.

9th January 1905.—No. 149.—The Chief Commissioner is pleased to invest Mr. H. E. Bartlett, Deputy Conservator of Forests, Ellichpur Division, with the powers specified in section 36 (1) a, b, and c, of the Berar Forest Law, 1886, as amended by the Berar Forest Law Amendment Law, 1891.

10th January 1905.—No. 159.—On return from duty in Siam, Mr. D. O. Witt, Deputy Conservator of Forests, is posted to the charge of the Nimar Forest Division.

No. 159-A. — Privilege leave for three months, under articles 246 and 260 of the Civil Service Regulations, in combination with furlough for nine months, under articles 233 and 308 (b) of the Civil Service Regulations, is granted to Mr. A. St. V. Beechey,

Deputy Conservator of Forests, in charge of the Nimar Forest Division, with effect from the date of his relief by Mr. Witt.

20th January 1905.—No. 444.—Mr. V. G. Morgan, Assistant Conservator of Forests, attached to the Direction Division, Jubbulpore, is transferred to the Mandla Forest Division, and is attached to that Division for the purpose of preparing a Working Plan for the Motinala Forests.

27th January 1905.—No. C-478.—Privilege leave for fourteen days, under article 260 of the Civil Service Regulations, is granted to Papannah, Forest Ranger, 6th grade, Permanent Establishment, of the Ellichpur Division, with effect from the date on which he may be relieved.

8.—BURMA GAZETTE.

29th December 1904.—No. 46.—Mr. C. H. Hearsey, Forest Ranger, is transferred from Ataran to the West Salween Division, and he assumed charge of the Martaban Range on the forenoon of the 20th September 1904.

No. 47.—Mr. W. J. G. Cooper, Extra Assistant Conservator of Forests, made over, and Mr. E. B. Powell, Extra Assistant Conservator of Forests, received charge of the Thaton Sub-Division on the afternoon of the 18th November 1904.

3rd January 1905.—No. 1.—With reference to Revenue Department Notification No. 551 (Forests), dated 28th November 1904, Mr. A. Lawrence, Officiating Deputy Conservator of Forests, made over, and Mr. S. Carr, Deputy Conservator of Forests, received charge of the Yaw Forest Division, on the forenoon of the 9th December 1904.

7th January 1905.—No. 2.—With reference to Revenue Department Notification No. 513 (Forests), dated 12th November 1904, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, made over, and Mr. G. R. Jeffery, Assistant Conservator of Forests, received charge of the Gangaw Sub-Division, Yaw Division, on the afternoon of the 6th December 1904.

9th January 1905.—No. 1.—Mr. E. W. Dalton, Ranger, 3rd grade, sub. *pro. tem.*, on his transfer from Katha Division assumed charge of his duties in the Upper Chindwin Division, on the afternoon of the 25th December 1904.

9.—ASSAM GAZETTE.

29th December 1904.—No. 10880-G.—In supersession of Notification No. 11140-G., dated the 31st December 1903, Mr. E. M. Coventry is appointed to be Deputy Conservator of Forests, 3rd grade, with effect from the 27th October 1903.

This cancels so much of Notification No. 6966-G., dated the 29th July 1904, as relates to Mr. Coventry.

16th January 1905.—No. 388-G.—Mr. A. R. Dicks, Deputy Conservator of Forests, on return from leave, is appointed to the charge of the Cachar Forest Division.

16th January 1905.—No. 389-G.—The following is published:—

The undermentioned officer has been granted by His Majesty's Secretary of State for India extension of leave as advised in list dated the 9th December 1904.

Name.	Service.	Appointment.	Period and nature of extension.
Mr. H. G. Young	...	Deputy Conservator of Forests, Assam.	Permission to remain on furlough until receipt of the orders of the Government of India, regarding his memorial.

23rd January 1905.—No. 394-F.—Mr. W. Breakey, Extra Assistant Conservator of Forests, attached to the Singbhum Division, is granted fifteen days

privilege leave, under articles 246 and 260 of the Civil Service Regulations, with effect from the forenoon of the 26th December 1904.

10.—MYSORE GAZETTE.

23rd December 1904.—No. R.-5520—Fl.-41-04-12.—Mr. B. Ramaswamy Iyer, B. A., Assistant Conservator of Forests, having availed himself of the privilege leave granted to him in Notification No. R.-1316-41-2, dated the 15th August 1904, from the forenoon of the 22nd August 1904 and rejoined duty on the forenoon of the 21st, November 1904, the unexpired portion of leave, *vis.*, one day, is hereby cancelled.

18th January 1905.—No. K.-6188—Ft.-124-04-12. Under article 188 of the Mysore Service Regulations, Mr. M. G. Rama Rao, Assistant Conservator of Forests of the Kadur District, is granted privilege leave of absence for seven days, with effect from such date as he may avail himself of it. Mr. H. Ramaiya, Sub-Assistant Conservator of Forests, will be in charge of the Kadur District Forest Office, in addition to his own duties, during the absence of Mr. Rama Rao.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S CIRCULAR.

January 2nd, 1905.

EAST INDIA TEAK.—The importation of Timber and Planks has been :—

			Loads	Deliveries
1898	...	...	18,083	18,526
1899	...	...	12,835	17,017
1900	...	...	15,024	11,053
1901	...	...	12,860	13,807
1902	...	...	8,762	12,598
1903	...	...	14,658	11,888
1904	...	...	7,992	10,293

The efforts made in 1903 to bring forward heavier supplies of Teak timber for Europe have relapsed again, and the importation last year was one of the smallest on record. Shippers have, in fact, no need to bring forward anything at all. They can sell their scanty supplies of logs fit for the purpose, at great prices, when they get them down the rivers, and leave to others the trouble and risk of finding further markets for them. The various Naval yards of the world will be hard put to it to find their supplies for 1905, and but little can be left for commerce. For Burmese and Siamese wood of normal specification, prices have ruled very high in London throughout 1904. It has been a minute business, a great part of the London trade devolving now on to small and sundry wood, as costing less money, and on to the new shipments from Java, which have come in very handy. The consumption has outrun the importation, and the stock is reduced to a low ebb. There is no prospect of more ample supplies coming here in 1905. Teak, in the old narrow sense, must continue to be looked upon as a luxury; but there is still plenty of Teak to be obtained, for all ordinary purposes, by degrees.

CRDAR—EAST INDIA.—Several small parcels were sent, but although a few logs were sold privately as a trial at a good price, there was no general demand, and when sales were forced prices were disastrous. The stock on hand is quite sufficient. Quotations are nominally from 2d. to 2½d. per foot.

PADOUK—EAST INDIA.—The brisk demand existing at the beginning of the year collapsed suddenly and most unexpectedly in February owing to the withdrawal of orders from the United States, which had been until then the principal market. This arose chiefly from a change in fashion there for car fittings. There has been, and still is, no indication of any better demand; therefore prices have become almost nominal. —AFRICAN.—Several small parcels were sent *via* the Continent, but proved almost

unsaleable for the same reasons which affected East India wood, and some still remain on hand. Quotations are nominally, for East India wood from 3s. to 4s., and for African from 2s. 6d. per foot cube.

ROSEWOOD—EAST INDIA.—There was a satisfactory demand for large, good logs in the first half of the year, but this fell off when supplies came forward in excess of consumption; in the later months stocks accumulated and prices became somewhat easier. Small and poor logs were dull of sale all along, even very low prices failing to tempt buyers. The total import was slightly more than that of the previous year, and the stock brought forward is enough for the present. Quotations for ordinary good parcels are from £6 to £12, but inferior wood is not worth more than about £4 per ton.

SATINWOOD—EAST INDIA. There was a material and very necessary reduction in the shipments. The demand was very quiet all through the year, and sales were still further restricted by the high limits at which most of the stock was held. Recently, more disposition to meet buyers led to larger sales being made, but there is still a considerable stock on hand. Quotations are from 7d. per foot upwards for plain logs and from 12d. upwards for figury wood.

EBONY—EAST INDIA.—Imports were small, but the supply was quite sufficient as the demand was very dull, and therefore, although there is only a small stock on hand, shipments cannot be recommended. Quotations are nominally from £6 to £10 per ton.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

1st January 1905.

TEAK.—The salient feature of this market has been that, notwithstanding the restricted consumption caused by high prices and depression in the shipbuilding trade, such consumption has nevertheless steadily exceeded the imports, with the result that the stocks of Teak in consumers' hands have gradually become exhausted, and the shippers have consequently made their increased scale of prices effective, in face of the natural outcry of "prohibitive" prices. It must be recognized that the substitution of other woods, and more especially of steel, for teak in rolling-stock construction, is seriously encouraged by the present cost of Teak, and also that the fashion during recent years of using Teak for first-class architectural purposes has been checked by the increasing cost; but against all this must be set the fact that naval architects still find no satisfactory substitute for Teak in the construction of warships, and the United States Government, notwithstanding its natural desire to use its native woods, has given its authority to the necessity of using Teak in the building of her warships. The political position in Europe foreshadows no diminution in naval construction, and if the output from the Teak forests in Burma and Siam continues to be of the decreasing volume of the last few seasons, Teak must continue high in price—even should its use be confined to naval constructive purposes. It is, however, quite clear that even at the present cost it will keep in the market for other construction of a high character; and although an increase of 20 to 25 per cent in the cost of material for construction is a heavy handicap for its use, it is not necessarily prohibitive where labour rather than material is the chief factor of cost in a finished production. The actual results of the past year are broadly that, whilst the imports of Teak to Europe have been some 30 per cent below the unusually small import of 1903, the consumption has fully equalled that of such year and exceeded the import by some 20 per cent, with the consequence that not only are the stocks in merchants' and dealers' hands fully 40 per cent below those of last year, but the stocks actually in consumers' hands for their constructive needs are unprecedentedly low; and the increased cost also naturally limited them to hand-to-mouth buying. It must also be borne in mind that even the present small supplies in Europe include a very appreciable proportion of Java Teak, which, although useful for some purposes, has not found favour with consumers for high-class work, and is also largely of a length unsuitable to shipbuilders.

In respect to London *per se*, the imports into and deliveries from the London Docks during the twelve months ending 31st December 1904 show as follows :--

Logs	...	3,623	loads imported, against 5,489 loads delivered into consumption.
Planks and			
Conversions	...	3,699	" " 4,123 " " "
Total	...	7,322	" " 9,612 " " "

NOTE.—The above figures deal only with *landed* stocks, and are exclusive of the over-side deliveries, which, although very important in quantity, are not noted by the Dock companies.

The dock stocks at date analyse as follows :—

LOGS.—Burma					
and Siam	...	3,465			
Java	...	1,616			
			— 5,081 loads, as against 6,952 loads at the same date last year.		
PLANKS.—Burma and					
Siam		2,751			
Java	...	737			
			— 3,488 " " 3,914 " " "		
Total	...	8,569	" " 10,866 " " "		

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

28th January 1905.—No. 148-F - Mr. C. O. Hanson, Deputy Conservator of Forests, 3rd grade, on the Punjab-Central Provinces combined list, is permitted, at his own request, to resign his appointment, with effect from the 1st February 1905.

31st January 1905.—No. 157-F.—Mr. J. W. Oliver, Conservator of Forests, 1st grade, on leave, is permitted to retire from the service of Government, with effect from the 11th December 1904.

From the same date the following promotions are made : -

- (i) Mr. F. B. Bryant, Conservator of Forests, 2nd (officiating 1st) grade, Upper Burma, is confirmed in the latter grade.
- (ii) Mr. H. Slade, Conservator of Forests, 3rd (officiating 2nd) grade, Upper Burma, is confirmed in the latter grade.
- (iii) Mr. L. Mercer, Officiating Conservator of Forests, 3rd grade, United Provinces, is confirmed in that grade.

1st February 1905.—No. 168-F.—The services of Mr. F. H. Todd, Deputy Conservator of Forests, 4th grade, Burma, are placed temporarily at the disposal of the Superintendent of Port Blair, from the 24th November 1904, for employment in the Andamans. Mr. Todd will continue to be borne on the Burma establishment while so employed.

2.—MADRAS GAZETTE.

31st January 1905—*Cancellation of Transfer.*—So much of notification, dated 2nd January 1905, printed on page 34, Part II of the *Fort St. George Gazette*, dated 10th January 1905, relating to the transfer of V. P. Ramalingam Pillai, Forest Ranger, 2nd grade, to South Coimbatore, is cancelled, and he will be placed on special duty under the Working Plans Officer, Southern Circle.

2nd February 1905.—The officers mentioned below have been declared by the Board to have passed at the half-yearly examination held in January 1905 in the subjects mentioned :—

Mr. A. H. Simpson, Ranger, 6th grade in F.R. and O.P.A.

Mr. R. Ry. K. Aswathan Naidu, Ranger, 2nd grade, in F.L.

Mr. E.M. Crothers, Ranger, 5th grade, in F.L.

M.R. Ry. C. A. Natesa Aiyar, Acting Deputy Ranger, 1st grade, in F.R. and O.P.A.

Mr. L.S. James, Ranger, 5th grade, in F.L.

3rd February 1905.—*Departmental Test.*—The following candidates are declared to have passed the Departmental Test examination held on the 5th January 1905, under section 69 of the Forest Code, in the subjects noted against each :—

No.	Name.	Designation.	Subjects passed
1.	T. K. Ramaswami Aiyar.	Forester, Chingleput ...	Forest Accounts and Returns.
2.	V. Jaganathan Pillai ...	Probationary Deputy Ranger, South Salem.	Forest Act and Rules and Forest Accounts and Returns.
3.	T. Kesavalu Naidu ...	Forester, Nellore ...	Forest Accounts and Returns.
4.	M. Subroya Mudaliar ...	Do. ...	Forest Act and Rules.

13th February 1905.—*Departmental Test*.—The following subordinates are declared to have passed the Forest Departmental test in both the branches, *vis.* (a) Forest Act and Rules and (b) Forest Code and Accounts:—

- (1) T. B. Rajagopala Mudaliar, Temporary Forester, 1st grade, Kurnool West.
- (2) N. S. Seshadri, Temporary Deputy Ranger, 3rd grade, Bellary
- (3) P. Rungabashyam Naidu, Forester, 3rd grade, and Temporary Deputy Ranger, 3rd grade, Anantapur.

Notification.—The probationary period of M. Streenivasa Row, Ranger, 6th grade, acting sub. *pro tem.*, Kurnool East, is extended by six months.

14th February 1905.—*Departmental Test*.—The following subordinates have passed the Departmental test in parts noted against their names of section 69 of the Forest Code at the examination held on the 25th January 1905:—

Name and Designation.	In part (a) or (b).
A. K. Appaiya Aiyar, B. A., Probationary Deputy Ranger ...	(a) and (b)
C. Achutha Warriar, Forester, 3rd grade ...	(a) and (b).
S. Nagappa Aiyar, Clerk, District Forest Office ...	(b).

16th February 1905.—No. 58.—The combined leave and furlough for thirteen months granted to Mr. Cecil Ernest Claude Fischer, Acting District Forest Officer, Ganjam, in notification No. 392, published on page 1229 of Part I of the *Fort St. George Gazette*, dated 22nd November 1904, will be converted into privilege leave for three months.

3.—BOMBAY GAZETTE.

2nd February 1905.—No. 2868.—Mr. R. H. Madan, Extra Deputy Conservator of Forests, 3rd grade, and Mr. G. S. Hinge, Extra Assistant Conservator of Forests, 1st grade, respectively delivered over and received charge of the Sub-Division Forest Office, South Thana, on the 25th January 1905, in the afternoon.

7th February 1905.—No. 1022.—His Excellency the Governor in Council is pleased to appoint Mr. G. R. Duxbury, on return to duty, to be Divisional Forest Officer, Satara, vice Mr. H. W. Keys proceeding on leave.

8th February 1905.—No. 1046.—Mr. Ganesh Sakharam Hinge, Extra Assistant Conservator of Forests, 1st grade, and Sub-Divisional Forest Officer, South Thana, is granted an extension by one month of the privilege leave for one month granted to him by the Conservator of Forests, N. C., in his notification No. 2429, dated 30th November 1904.

13th February 1905.—No. 1219.—Mr. T. B. Fry, Conservator of Forests, Central Circle, is granted privilege leave of absence for three months.

17th February 1905.—No. 1369. His Excellency the Governor in Council is pleased to appoint Mr. H. Murray to act as Conservator of Forests, Central Circle, during the absence on leave of Mr. T. B. Fry, or pending further orders.

4.—BENGAL GAZETTE.

6th February 1905.—No. 665 For.—The one month's privilege leave granted to Mr. J. P. Haslett, Extra Assistant Conservator of Forests, in notification No. 4812, dated 16th December 1904, is extended by one day.

20th February 1905.—No. 939 For. Mr. C. C. Hatt, Deputy Conservator of Forests, in charge of the Buxa Forest Division and Working Plans Officer of that Division, is granted combined leave for six and a half months, *vis.*, privilege leave for three months under Article 233 of the Civil Service Regulations, and furlough under Article 308 (b) for the remaining period with effect from the 12th April 1905, or from such subsequent date as he may avail himself of the leave.

Mr. F. Trafford, Deputy Conservator of Forests, in charge of the Jalpaiguri Division, is placed in charge of the Buxa Division, in addition to his other duties, during the absence, on leave, of Mr. Hatt, or until further orders.

5.—UNITED PROVINCES GAZETTE.

1st February 1905.—No. 413 - II 186 A-12.—The following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from,	Consequent on	Name.	From.	To.
1	1st November 1904.	Becoming eligible for promotion.	Mr. R. St. G. Burke.	Assistant Conservator of Forests, 2nd grade.	Officiating Deputy Conservator of Forests, 4th grade.
2	Do.	Do.	Mr. E. A. Courthope.	Officiating Deputy Conservator of Forests, 4th grade.	Officiating Assistant Conservator of Forests, 1st grade.
3	15th December 1904.	The return from leave of Mr. H. G. Billson.	Mr. F. Canning.	Assistant Conservator of Forests, 2nd grade.	Do. do.
			Mr. H. G. Billson.	Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			Mr. F. F. R. Channer.	Officiating Deputy Conservator of Forests, 3rd grade.	Do. do.
			Mr. R. St. G. Burke.	Do. do.	Officiating Assistant Conservator of Forests, 1st grade.
			Mr. F. Canning.	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 2nd grade.

6.—PUNJAB GAZETTE.

28th January 1905.—No. 148-F.—Mr. C. O. Hanson, Deputy Conservator of Forests, 3rd grade, on the Punjab-Central Provinces Combined list, is permitted, at his own request, to resign his appointment, with effect from the 1st February 1905.

3rd February 1905.—No. 42.—*Transfer*.—Lala Mulraj, Extra Assistant Conservator of Forests, is transferred from the Chamba to the Lahore Forest Division, with effect from 17th January 1905.

14th February 1905.—No. 66—A. L. No. 2 —*Notification*.—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the dates specified against each :—

Name.	Present Grade.	Grade to which promoted or reverted	With effect from	REMARKS.
Mr. C. O. Hanson ...	Deputy Conservator, 3rd grade.	Deputy Conservator, 2nd grade, sub. <i>pro tem</i> on furlough.	2nd November 1904.	Consequent on the deputation to the Bundelkhand State of Mr. R. Williamson.
Mr. H. E. Bartlett ...	Ditto ...	Officiating Deputy Conservator, 2nd grade.		
Mr. W. Mayes ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 3rd grade, sub. <i>pro tem</i> .		
Mr. S. L. Kenny ...	Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. J. C. Carroll ...	Officiating Deputy Conservator, 4th grade.	Deputy Conservator, 4th grade, sub. <i>pro tem</i> .		
Mr. A. A. Dunbar Brander.	Assistant Conservator, 1st grade.	Officiating Deputy Conservator, 4th grade.		

No. 70.—*Notification*.—Consequent on the retirement from the service of Lala Jowala Pershad, Extra Assistant Conservator, 1st grade. His Honour the Lieutenant-Governor is pleased to order the following promotions with effect from the 20th December 1904:—

Mr. Fazl-ud-din II, Extra Assistant Conservator, 2nd grade (on deputation to Patiala State), to be Extra Assistant Conservator, 1st grade.

Bhai Sadu Singh, Extra Assistant Conservator, 2nd grade, Provisional, to be Extra Assistant Conservator, 1st grade, sub. *pro tem*.

14th February 1905 —No. 73.—A L No. 3.—*Notification*—The following changes have taken place in the list of Forest Officers in the Associated Provinces with effect from the date specified against each:—

Name.	Present Grade.	Grade to which promoted or reverted.	With effect from	REMARKS.
Mr. J. C. Carroll ...	Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	20th July 1904	Consequent on Mr. D. O. Witt's return from deputation and departure on 2 months and 1 day's privilege leave, combined with 3 months and 29 days' furlough.
In Notification No. 360—A. L. No. 12 of Mr. J. C. Carroll ...	Provisional Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	23rd August 1904, instead of Provisional Deputy Conservator, 4th grade.		
please read.				
Mr. J. C. Carroll ...	Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.		
Mr. C. Somers Smith	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.		
Mr. A. St. V. Beechey	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.		
Mr. R. S. Hole ...	Provisional Deputy Conservators, 4th grade.	Provisional Deputy Conservators, 4th grade and Officiating Deputy Conservators, 3rd grade.	15th September 1904.	Consequent on Mr. G. F. Taylor's departure on 2 months' privilege leave.
Mr D. O. Witt Mr. J. C. Carroll ...		Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.		
Mr. C. P. Fisher ...	Deputy Conservator, 2nd grade, and Officiating Conservator, 3rd grade.	Deputy Conservator, 1st grade, and Officiating Conservator, 3rd grade.		
Mr. A. V. Monro ...	Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 1st grade.		
Mr. J. E. Barrett ...	Provisional Deputy Conservator, 2nd grade.	Deputy Conservator, 2nd grade.		
Mr. R. M. Williamson.	Officiating Deputy Conservator, and Grade.	Provisional Deputy Conservator, 2nd grade.	15th September 1904.	Consequent on Mr. W. Shakespear's retirement.
Mr. H. E. Bartlett ...	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.		

Name.	Present Grade.	Grade to which promoted or reverted	With effect from	REMARKS.
Mr. A. St. V. Beechy	Officiating Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	25th September 1904.	Consequent on Mr. W. Shakespeare's retirement.
Mr. W. Mayes ..	Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.		
C.P. Pilot No. 2 ...	Provisional Deputy Conservator, 4th grade.	Deputy Conservator, 4th grade.		
Mr. A. J. Gibson ...	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.		

The Central Provinces Pilot II having risen to Deputy Conservator, 4th grade, substantially beyond which it is not to rise one of the appointments of that grade is abolished, reducing the number thereof from 6 to 5.

Mr. A. V. Monro ...	Officiating Deputy Conservator, 1st grade.	Deputy Conservator, 2nd grade.	17th October 1904.	Consequent on Mr. G. F. Taylor's return from privilege leave.
Mr. W. Mayes ...	Officiating Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Officiating Deputy Conservator, 3rd grade.		
Mr. A. J. Gibson ...	Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.		
Mr. B.O. Coventry...	Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 2nd grade.		
Mr. A. St. V. Beechy	Provisional Deputy Conservator, 3rd grade, and Officiating Deputy Conservator, 2nd grade.	Provisional Deputy Conservator, 3rd grade.	21st November 1904.	Consequent on Mr. B. O. Coventry's return from furlough.
Mr. R. S. Hole ...	Provisional Deputy Conservators, 4th grade, and Officiating Deputy Conservators, 3rd grade.	Provisional Deputy Conservators, 4th grade.		
Mr. D. O. Witt ...	Officiating Deputy Conservator, 4th grade, and Officiating Deputy Conservator, 3rd grade.	Officiating Deputy Conservator, 4th grade.		
Mr. J. C. Carroll ...	Officiating Deputy Conservator, 4th grade.	Officiating Deputy Conservator, 4th grade.		
Mr. A. D. Blascheck	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.	21st November 1904.	Consequent on Mr. Caccia's return from privilege leave.
Mr. H. E. Bartlett ...	Officiating Deputy Conservator, 2nd grade.	Deputy Conservator, 3rd grade.		
Mr. S. L. Kenny ...	Officiating Deputy Conservator, 3rd grade.	Deputy Conservator, 4th grade.		
Mr. A. A. Dunbar Brander.	Officiating Deputy Conservator, 4th grade.	Assistant Conservator, 1st grade.		

17th February 1905.—No. 92.—A. L. No. 4.—*Notification*.—Mr. V. G. Morgan, Assistant Conservator of Forests, 2nd grade (Central Provinces), having passed the examination prescribed in section 72 of the Forest Department Code, is promoted to Assistant Conservator of Forests, 1st grade, with effect from the 15th December 1904.

7.—CENTRAL PROVINCES GAZETTE.

6th February 1905.—No. 845.—Privilege leave for two months and one day, under Articles 246 and 260 of the Civil Service Regulations, in combination with furlough for three months and twenty-nine days, under Articles 233 and 308 (b) of the Civil Service Regulations, was granted to Mr. D. O. Witt, Deputy Conservator of Forests, with effect from the 20th July 1901, the date on which he relinquished charge of his duties as Deputy Conservator of Forests in Siam.

Order No. 159, dated the 10th January 1905, is hereby cancelled.

No. 846.—On return from leave granted him in Order No. 845, dated the 6th February 1905, Mr. D. O. Witt, Deputy Conservator of Forests, is attached to the Nimar Forest Division, until further orders.

13th February 1905.—No. C-527.—Consequent on the restoration of Pandit Dinkar Vishnu Pranjpe, Forest Ranger, in the 2nd grade, sub. *pro tem*, from the 1st July 1904, ordered in Departmental Order No. 5 of the 7th idem, Mr. E. A. Rooke, who is on deputation to the Bastar State from the 28th January 1904, reverts to his substantive appointment of Ranger, 3rd grade, with effect from the 1st July 1904.

14th February 1905.—No. 194.—Under the authority conferred by Article 31, clause (1), of the Forest Department Code, Babu Maula Baksh, a private student of the Imperial Forest School Dehra Dun, who had duly obtained the Forest School Higher Standard Certificate, with honours, in 1904, is appointed, on probation, as Ranger, 4th grade, sub. *pro tem*, with effect from the 9th January 1905, and is posted to the Betul Division.

22nd February 1905.—No. 1201.—Mr. P. S. Corbould, Assistant Conservator of Forests, attached to the Direction Division, Northern Circle, is transferred to the Saugor Division, to which he will be attached till further orders.

8.—BURMA GAZETTE.

No. 6.—With reference to Revenue Department Notification No. 494 (Forests), dated the 5th November 1904, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, assumed charge of the Bampton Sub-Division, Southern Shan States Division, on the forenoon of the 23rd December 1904.

26th January 1905.—No. 5.—With reference to Revenue Department Notification No. 550 (Forests), dated the 28th November 1904, Mr. T. W. Forester, Extra Assistant Conservator of Forests, made over, and Mr. C. E. Muriel, Deputy Conservator of Forests, received, charge of the Pyinmana Forest Division on the forenoon of the 23rd December 1904.

23rd January 1905.—No. 2 (Forests).—With reference to Revenue Department Notification No. 751 (Forests), dated the 9th December 1904, Mr. F. Dalton, Ranger, 3rd grade, was relieved of his duties in the Upper Chindwin Division on the afternoon of the 13th January 1905.

19th January 1905.—No. 1.—With reference to Revenue Department Notification No. 678 (Forests), dated the 7th November 1904, Maung Ba O, Ranger, 3rd grade, assumed charge of his duties as Assistant Manager, Mergui Rubber Plantation, on the forenoon of the 21st December 1904.

25th January 1905.—No. 2.—With reference to Revenue Department Notification No. 751 (Forests), dated the 9th December 1904, Mr. F. Dalton, Forest Ranger, assumed charge of his girdling duties in Toungoo on the forenoon of the 19th January 1905.

31st January 1905.—No. 157-F.—Mr. J. W. Oliver, Conservator of Forests, 1st grade, on leave, is permitted to retire from the service of Government, with effect from the 11th December 1904.

From the same date the following promotions are made :—

- (i) Mr. F. B. Bryant, Conservator of Forests, 2nd (officiating 1st) grade, Upper Burma, is confirmed in the latter grade.
 (ii) Mr. H. Slade, Conservator of Forests, 3rd (officiating 2nd) grade, Upper Burma, is confirmed in the latter grade.

1st February 1905.—No. 168-F.—The services of Mr. F. H. Todd, Deputy Conservator of Forests, 4th grade, Burma, are placed temporarily at the disposal of the Superintendent of Port Blair, from the 24th November 1904, for employment in the Andamans. Mr. Todd will continue to be borne on the Burma establishment while so employed.

9.—ASSAM GAZETTE.

4th February 1905.—No. 1164G.—Babu Jnanada Charan Sen, Extra Assistant Conservator of Forests, in charge of the Cachar Forest Divisions, on relief by Mr. A. R. Dicks, Deputy Conservator of Forests, is transferred and attached to the Goalpara Forest Division.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S WOOD CIRCULAR.

3rd February 1905.

EAST INDIA TEAK.—The deliveries for the month have been 1,351 loads against 879 loads in January 1904. More demand for converted parcels is apparent at satisfactory prices, but logs have been slow of sale.

ROSEWOOD—EAST INDIA.—There has been rather more demand, but the stock on hand is still sufficient.

SATINWOOD—EAST INDIA.—Sales continue to be quite of a retail character, and stocks are still considerable.

EBONY—EAST INDIA.—Stocks are more than sufficient for current demand.

PRICE CURRENT.

Indian teak, logs,	per load	...	...	...	£10 to £18 10s.
" " planks	"	...	...	...	£13 to £20
Rosewood, per ton	...	...	...	...	£5 to £12
Satinwood " sq. ft.	...	...	...	...	7d. to 18d
Ebony " ton	...	...	...	...	£6 to £10

DENNY, MOTT AND DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st February 1905.

TEAK.—The landings in the docks in London during January consisted of 46 loads of logs and 310 loads of planks and scantlings, or a total of 356 loads, as against 883 loads for the corresponding month of last year. The deliveries into consumption were 798 loads of logs and 457 loads of planks and scantlings—together 1,255 loads, as against 790 loads for January 1904.

The dock stocks at date analyse as follows:—

	4,329 loads	of logs,	as against	6,904 loads	at the same date last year.
	3,341	planks	„	4,055	„ „
Total	7,670 loads		„	10,959 loads	„ „

The above figures tell their own tale of the continuous falling off in supplies, and the consequent inconvenient shrinkage of stocks which are not only very unduly small, but of a specification too poor to satisfactorily meet the requirements of consumers. Prices continue to rise in consequence, and business is of a necessarily restricted character, as even high prices cannot increase the volume of supply. if the cry of *non possumus* is genuine, as the state of shipments seem to prove it to be.

MARKET RATES FOR PRODUCTS.

TROPICAL AGRICULTURIST.

1st February 1905.

Cardamoms	...	...	per lb	1s. to 1s. 5d
Croton seeds	...	...	„ cwt.	20s to 25s.
Cutch	...	...	„ „	25s. to 35s.
Gum Arabic	...	...	„ „	17s. 6d. to 25s.
Do. Kino	...	...	„ „	6d. to 9d
India-rubber, Assam	...	...	„ lb.	7s 6d. to 3s. 7d.
Do. Burma	...	...	„ „	2s. to 3s. 4½d.
Myrabolans, Madras	...	...	„ cwt.	5s. to 6s.
Do. Bombay	...	...	„ „	4s. 3d. to 4s. 6d.
Do. Jubbulpore	...	...	„ „	4s. to 6s. 9d.
Do Bengal	...	...	„ „	3s. 6d to 6s. 4½d.
Nux vomica { Cochin	...	...	„ „	Nominal.
Bengal	...	...	„ „	Do.
Oil, Lemon grass	...	...	„ „	8d.
Orchella weed Ceylon	...	...	„ „	10s. to 12s. 6d.
Seedlac	...	...	„ „	150s. to 190s.
Tamarinds, Calcutta	...	...	„ „	7s to 8s.
Do. Madras	...	...	„ „	4s. 6d.

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

6th March 1905.—No. 334-F.—Mr. R. McIntosh, Deputy Conservator of Forests, 3rd grade, Madras, is transferred to Burma in the interests of the public service, with effect from the date on which he makes over charge of his duties as Instructor, Imperial Forest School, Dehra Dun.

23rd March 1905.—No. 424-F.—Mr. T. A. Hauxwell, Conservator of Forests, 2nd grade, on return from the leave granted to him in the Notification of this Department No. 542-F.-75-7 dated the 20th May 1904, is re-appointed to the charge of the Northern Circle, Upper Burma, with effect from the 11th February 1905, the date on which he relieved Mr. H. Slade, Conservator, 2nd grade.

2. From the same date Mr. A. L. McIntire, Conservator, 3rd (officiating 2nd) grade, reverted to his substantive appointment in the former grade.

28th March 1905.—No. 461-F.—Mr. H. Slade, Conservator of Forests, 2nd grade, on being relieved by Mr. T. A. Hauxwell of the charge of the Northern Circle, Upper Burma, was placed on special duty. The following promotions are made, with effect from the 13th March 1905, in consequence of the death of Mr. H. Slade:—

(i) Mr. A. L. McIntire, Conservator of Forests, 3rd grade, Bengal, is appointed, to be Conservator, 2nd grade

(ii) Mr. C. P. Fisher, Officiating Conservator, 3rd grade, Central Provinces, is confirmed in that grade.

From the same date Mr. H. Jackson, Officiating Conservator of Forest, 3rd grade, reverted to his substantive rank on the Burma List, but continues to be *seconded* as Deputy Director of the Imperial Forest School, Dehra Dun.

2.—MADRAS GAZETTE.

27th February 1905.—*Appointment*.—Mehr Chand, private student, Forest School, Dehra Dun, is appointed Probationary Ranger, 6th grade, Bellary district, from the date of his passing the final examination.

2nd March 1905.—*Promotions*.—The following promotions are ordered in the Rangers' Class of the Southern Circle with the sanction of the Board of Revenue, with effect from 1st November 1904:—

M. Panchapekasa Iyer, Ranger, from 3rd grade and acting in the 2nd grade to 2nd grade, permanent.

V. Raman Menon, Ranger, from 4th grade to 3rd grade, permanent.

C. S. Venkatramana Iyer, Ranger, from 4th grade, and acting in the 3rd grade to 3rd grade, acting sub. *pro tem*.

S. Kuppaswamy Chetty, Ranger, from 4th grade to 3rd grade, acting sub. *pro tem*.

L. S. Janes, Ranger, from 5th grade to 4th grade, acting sub. *pro tem*.

A. P. Singaravelu Mudaliar, Ranger, from 5th grade to 4th grade, acting sub. *pro tem*.

3rd March 1905.—*Transfers*.—M. R. Ry. V. S. Gurunatha Pillai Avargal, Extra Assistant Conservator of Forests, 2nd grade, and Working-Plans Officer, Central Circle, is transferred to the Southern Circle to be in charge of the school for training Deputy Rangers and Foresters.

2. M. R. Ry. K. Ramaswami Aiyar, Acting Ranger, 5th grade, in the Northern Circle, is transferred to the Southern Circle to act as Instructor in the school for training Deputy Rangers and Foresters.

4th March 1905.—*Promotions*.—The Board has, in its Proceedings, F. No. 189, Mis., dated 24th February 1905, sanctioned the following promotions in the class of Rangers to take effect from 1st November 1904:—

(1) L. Hanumanthulu, Ranger, Guntur, from 2nd grade to 1st grade permanent.

(2) K. Aswathan Naidu, Ranger, Kurnool East, from 3rd grade and acting in the 2nd grade to 2nd grade, permanent.

(3) N. S. Anantachari, Ranger, Kistna, from 4th grade and acting in the 3rd grade to 3rd grade, permanent.

(4) D. A. Stracey, Ranger, Gadavari, from 4th grade and acting in the 3rd grade to 3rd grade, permanent.

(5) A. Sreenivasa Hebbar, Ranger, Guntur, from 5th grade to 4th grade, acting sub *prom.*

(6) A. Hanumantha Rao, Ranger, Anantapur, from 6th grade to 5th grade, permanent.

(7) K. G. Venkatasana Iyer, Ranger, Kurnool West, from 6th grade, to 5th grade, acting sub *prom.*

(8) K. Ramaswami Iyer, Ranger, Vizazapatam, from 6th grade to 5th grade, acting sub *prom.*

7th March 1905. — No. 71. — Under articles 233, 260 and 338 of the Civil Service Regulations (fourth edition), Mr. J. Tapp, Extra Assistant Conservator of Forests, Kurnool district, is granted combined privilege leave and furlough for six months with effect from date of relief.

No. 72. — Mr. E. D. M. Hooper, Conservator of Forests, Central Circle, is granted combined privilege leave and furlough without medical certificate for one year from or after 1st April next, under articles 233, 260 and 338 of the Civil Service Regulations.

8th March 1905. — *Cancellation of Transfer.* — So much of the notification published on page 34 of Part II of the *Fort St. George Gazette*, dated 10th January 1905, as relates to the transfer of Mr. A. B. Myers, Ranger II, from South Combatores to the Nilgiris, is cancelled.

3.—BOMBAY GAZETTE.

27th February 1905. — No. 1664. — His Excellency the Governor in Council is pleased to appoint Mr. Noshirvan Gustap, Ph. D., to be 4th grade Extra Assistant Conservator of Forests, on probation, and to do duty as Sub-Divisional Forest Officer, N. D. Kanara, *vice* Mr. Harihar Anant Nadkarni, I.C.E., deceased.

28th February 1905. — No. 3, 95. — In exercise of the powers delegated to him under Government Resolution No. 2180, dated 20th March 1889, the Conservator of Forests, N. C., has granted one month's privilege leave with effect from the 16th instant to Mr. C. G. Dalia, Extra Assistant Conservator of Forests, 2nd grade, and Sub-Divisional Forest Officer, Surat.

No. 396. — Mr. C. G. Dalia, Extra Assistant Conservator of Forests, 2nd grade, delivered over and Mr. E. M. Hodgson, acting Deputy Conservator of Forests, 3rd grade, received charge of the office of the Sub-Divisional Forest Officer, Surat, on the 16th February 1905, in the afternoon.

27th February 1905. — No. 3481. — Messrs. T. B. Fry, Conservator of Forests, and H. Murray, Deputy Conservator of Forests, respectively handed over and received charge of the office of Conservator of Forests, C. C., on the afternoon of the 17th February 1905.

Messrs. H. Murray, Deputy Conservator of Forests, and D. N. Damle, Extra Assistant Conservator of Forests, respectively handed over and received charge of the Divisional Forest Office, Nasik, on the forenoon of the 20th February 1905.

6th March 1905. — No. 3544. — Messrs. H. W. Keys, Deputy Conservator of Forests, 2nd grade, and G. R. Duxbury, Deputy Conservator of Forests, 3rd grade, respectively handed over and received charge of the Divisional Forest Office, Satara, on the afternoon of the 25th February 1905.

14th March 1905. — No. 8367. — Mr. G. J. Rege, Extra Assistant Conservator and Personal Assistant to the Conservator of Forests, S. C., who was allowed thirty days' privilege leave in this office Notification No. 7980, dated 25th ultimo, availed himself of the same on the afternoon of the 4th instant.

4.—BENGAL GAZETTE.

10th March 1905. — No. 1366-For. — Consequent on the departure of Mr. W. M. Green, Deputy Conservator of Forests, 1st grade, on the combined leave granted to him

in Notification No. 263-For., dated 14th January 1905, the following temporary promotions are ordered with effect from the 10th February 1905 :—

Mr. B. B. Osmaston, F. C. H., Deputy Conservator of Forests, 2nd grade, to officiate as Deputy Conservator of Forests, 1st grade.

Mr. W. F. Lloyd, Deputy Conservator of Forests, 3rd grade, to officiate as Deputy Conservator of Forests, 2nd grade.

Mr. E. P. Stebbing, Deputy Conservator of Forests, 4th grade, on deputation, to officiate as Deputy Conservator of Forests, 3rd grade.

Sir H. A. Farrington, Bart., Deputy Conservator of Forests, 4th grade, to officiate as Deputy Conservator of Forests, 3rd grade, *vice* Mr. Stebbing, seconded.

16th March 1905.—No. 1572.—Babu Debendra Nath Roy, late a Deputy Ranger in the Forest Department, Bengal, having been dismissed from Government service, is debarred from re-employment in any capacity under Government.

5.—UNITED PROVINCES.

8th March 1905.—No. 808-II, 23 1905.—Mr. F. Canning, Assistant Conservator of Forests, attached to the Kheri Forest Division, to hold charge of the Bahraich Forest Division, Oudh Circle, *vice* Mr. F. F. R. Channer, granted leave.

10th March 1905.—No. 846-II, 109-1905.—Consequent on the confirmation of Mr. L. Mercer, Deputy Conservator of Forests, 2nd grade, as Conservator of Forests :

Mr. P. H. Clutterbuck, Deputy Conservator of Forests, 3rd grade, to be Deputy Conservator of Forests, 2nd grade.

Babu Karuna Nidhan Mukarji, Extra Deputy Conservator of Forests, 4th grade, to be Extra Deputy Conservator of Forests, 3rd grade.

Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, 1st grade, to be Extra Deputy Conservator of Forests, 4th grade.

Mr. Keshavanand, Extra Assistant Conservator of Forests, 2nd grade, to be Extra Assistant Conservator of Forests, 1st grade.

Pundit Sadanand Gariola, Extra Assistant Conservator of Forests, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, but to continue on deputation.

Babu Nand Mal, Extra Assistant Conservator of Forests, 3rd grade, to be Extra Assistant Conservator of Forests, 2nd grade, provisionally substantive.

Lala Parmeshwari Din, Extra Assistant Conservator of Forests, 3rd grade, provisionally substantive to be confirmed in that grade.

Pundit Rama Dat, Extra Assistant Conservator of Forests, 4th grade, to be Extra Assistant Conservator of Forests, 3rd grade, provisionally substantive.

Saiyid Mahdi Hasan, Extra Assistant Conservator of Forests, 4th grade, provisionally substantive, to be confirmed in that grade.

Lala Madho Pershad, Extra Assistant Conservator of Forests, 4th grade sub. *pro tem.* to be provisionally substantive in that grade.

6.—PUNJAB GAZETTE.

Nil.

7.—CENTRAL PROVINCES GAZETTE.

1st March 1905.—No. 1404.—Mr. B. Inamati Sham Rao, Extra Assistant Conservator of Forests, 4th grade, having passed the examinations prescribed in Article 72 of the Forest Department Code, is hereby promoted to the 3rd grade of Extra Assistant Conservator of Forests, sub *pro tem.*, with effect from the 15th December 1904, in place of Mr. A. L. Chatterji, who will revert to the 4th grade of Extra Assistant Conservator of Forests, from the same date.

20th March 1905.—No. 1830.—Privilege leave for one month, under Articles 426 and 260 of the Civil Service Regulations, is granted to Mr. S. R. Parsons, Extra Assistant Conservator of Forests, in charge of the Damoh Forest Division, with effect from the afternoon of the 28th February 1905.

Mr. R. H. Cole, Forest Ranger, is placed in charge of the Damoh Forest Division during the absence of Mr. Parsons.

25th February, 1965.—No. 1319.—Mr. D. G. Watt, Deputy Conservator of Forests, attached to the Baram Forest Division, is posted to the charge of that Division, with effect from the 1st February 1965.

Mr. J. G. Hargrave, who has retired four times under Article 260 of the Civil Service Regulations, is granted to Mr. C. Maudslayi, Assistant Conservator of Forests, in charge of the Baram Division, and Personal Assistant to the Conservator of Forests, Baram Circle, with effect from the 1st January to the 31st January 1965.

No. 1318.—Mr. A. George, Extra Assistant Conservator of Forests, was relieved of the charge of the Baram Division in the afternoon of the 27th January 1965, and held charge of the Baram Division and acted as Personal Assistant to the Conservator of Forests, Baram Circle from that time till his resumption of charge of the Baram Division on the afternoon of the 31st February 1965.

No. 1317.—Mr. L. K. Maudslayi, Extra Assistant Conservator of Forests, Buliana Division, held charge of the Baram Division, in addition to the Buliana Division, from the afternoon of the 27th January to the afternoon of the 31st February 1965.

2. B. MALAYA GAZETTE.

1st March 1965.—No. 123, Forests.—Under the provisions of Articles 246 and 260 of the Civil Service Regulations Mr. H. C. Walker, Officiating Deputy Conservator of Forests, is granted privilege leave for one month and five days, with effect from the date on which he relinquished charge of his duties in the Taungthar Forest Division.

25th February 1965.—No. 169, Forests.—The following alterations in rank are ordered in the Baram Forest Division:—

- (1) With effect from the 1st June 1964:
Mr. J. D. Hamilton, Ranger, 2nd grade, to be Ranger, 1st grade.
Mr. R. B. Hargrave, Ranger, 3rd grade, to be Ranger, 2nd grade.
- (2) With effect from the 13th September 1964:
Mr. H. M. L. Carson, Ranger, 2nd grade, to be Ranger, 1st grade.
Messrs R. G. Ranger, 3rd grade, to be Ranger, 2nd grade, *pro tem*.
- (3) With effect from the 19th September 1964:
Messrs P. L. Ranger, 2nd grade, to be Ranger, 1st grade.
Messrs A. W. Ranger, 3rd grade, to be Ranger, 2nd grade.
- (4) With effect from the 22nd October 1964:
Mr. C. C. Gull, Ranger, 2nd grade, to be Ranger, 1st grade.
Messrs J. L. Ranger, 3rd grade, to be Ranger, 2nd grade.

No. 170, Forests *Corrigendum*.—In the last item of the Department Notification No. 569, dated the 13th December 1964, for "Mr. J. D. Hamilton, Ranger, 2nd grade, to be Extra Assistant Conservator, 4th grade *pro tem*, *read* "Mr. J. D. Hamilton, Ranger, 1st grade, to be Extra Assistant Conservator, 4th grade *pro tem*."

8th March 1965.—No. 3.—With reference to Revenue Department Notification No. 123 (Forests), dated the 1st March 1965, Mr. C. H. Walker, Officiating Deputy Conservator of Forests, availed himself of the leave, with effect from the afternoon of the 17th February 1965.

9. ASSAM GAZETTE.

14th March 1965.—No. 26386.—Mr. D. P. Copeland, Deputy Conservator of Forests, in charge of the Kamrup Forest Division, is granted privilege leave for three months combined with furlough for five months, under articles 233 and 378 (b) of the Civil Service Regulations, with effect from the 1st April 1965, or the subsequent date on which he may avail himself of the leave.

14th March 1965.—No. 26396.—Mr. E. M. Coventry, Deputy Conservator of Forests, in charge of the Darrang Forest Division, is appointed to hold charge of the Kamrup Forest Division, in addition to his own duties, during the absence on leave of Mr. D. P. Copeland, or until further orders.

10. MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S CIRCULAR.

2nd March 1905.

EAST INDIA TEAK.—The deliveries for February amount to 783 loads against 508 loads in February last year, making the aggregate for the two months past 2,134 loads against 1,787 loads for the same period of 1904. The London market has recently shown more life than for some time past, although prices have so far not been affected. The cutting off of supplies continues and will intensify, so that if the demand, which is now showing should also continue, even on the most moderate scale, it seems inevitable that prices for this wood must become rapidly dearer for, at any rate, the remainder of this year.

ROSEWOOD, EAST INDIA.—Remains quiet, and further supplies are not needed at present.

SATINWOOD, EAST INDIA.—The demand is quiet and sales small, the chief enquiry being for finely-figured logs.

EBONY, EAST INDIA.—The demand remains dull and stocks ample.

PRICE CURRENT.

Indian teak, logs, per load	...	...	...	£9 15s. to £18 10s.
" planks, "	...	...	...	£12 15s. to £20.
Rosewood, per ton	...	...	...	£5 to £12.
Satinwood, per s. ft.	...	...	...	7s to 18s.
Ebony, per ton	...	...	...	£6 to £10.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st March 1905.

TEAK.—The landings in the docks in London during February consisted of 976 loads of logs and 423 loads of planks and scantlings, or a total of 1,399 loads, as against 591 loads for the corresponding month of last year. The deliveries into consumption were 419 loads of logs and 363 loads of planks and scantlings—together 782 loads, as against 788 loads for February 1904.

The dock stocks at date analyse as follows:—

	4,886 loads of logs, as against 6,653 loads at the same date last year.				
3,401	planks	"	4,109	"	"
Total	8,287	loads	10,762	"	"

The increase shown in the above figures in the import of logs is due to the arrival of a small sailing cargo from Bangkok, which feature, however, is not likely to be repeated for a long time to come, owing to the small stocks at the shipping ports not permitting of the shippers committing themselves to the charter of even very small sailing ships. The market has, therefore, only to look to hand-to-mouth parcels by steamers for this year's supplies; and such chance shipments are mostly sold to the consumer whilst on the way, so that the present meagre dock stocks will tend to still further decrease.

Item	Quantity	Unit Price	Total
1. 1000 lbs. of No. 10 wire	1000	1.00	1000.00
2. 500 lbs. of No. 12 wire	500	.80	400.00
3. 250 lbs. of No. 14 wire	250	.60	150.00
4. 100 lbs. of No. 16 wire	100	.40	40.00
5. 50 lbs. of No. 18 wire	50	.30	15.00
6. 25 lbs. of No. 20 wire	25	.20	5.00
7. 10 lbs. of No. 22 wire	10	.15	1.50
8. 5 lbs. of No. 24 wire	5	.10	.50
9. 2 lbs. of No. 26 wire	2	.05	.10
10. 1 lb. of No. 28 wire	1	.02	.02
11. 1000 lbs. of No. 10 wire	1000	1.00	1000.00
12. 500 lbs. of No. 12 wire	500	.80	400.00
13. 250 lbs. of No. 14 wire	250	.60	150.00
14. 100 lbs. of No. 16 wire	100	.40	40.00
15. 50 lbs. of No. 18 wire	50	.30	15.00
16. 25 lbs. of No. 20 wire	25	.20	5.00
17. 10 lbs. of No. 22 wire	10	.15	1.50
18. 5 lbs. of No. 24 wire	5	.10	.50
19. 2 lbs. of No. 26 wire	2	.05	.10
20. 1 lb. of No. 28 wire	1	.02	.02

GAZETTE NOTIFICATIONS.

1.—GAZETTE OF INDIA.

28th March 1905.—No. 461-F.—Mr. H. Slade, Conservator of Forests, 2nd grade, on being relieved by Mr. T. A. Hauxwell of the charge of the Northern Circle, Upper Burma, was placed on special duty. The following promotions are made, with effect from the 13th March 1905, in consequence of the death of Mr. H. Slade :—

(i) Mr. A. L. McIntire, Conservator of Forests, 3rd grade, Bengal, is appointed to be Conservator, 2nd grade.

(ii) Mr. C. P. Fisher, Officiating Conservator, 3rd grade, Central Provinces, is confirmed in that grade.

From the same date Mr. H. Jackson, Officiating Conservator of Forests, 3rd grade, reverted to his substantive rank on the Burma List, but continues to be *seconded* as Deputy Director of the Imperial Forest School, Dehra Dun.

17th April 1905.—No. 506—3-9-F.—Mr. R. S. Troup, Deputy Conservator of Forests, 4th grade, Burma, is appointed to be Instructor at the Imperial Forest School, with effect from the 3rd April 1905, relieving Mr. R. McIntosh, Deputy Conservator of Forests, 3rd grade, who is transferred from that date to the Burma Forest List.

27th April 1905.—No. 519—201-9-F.—Mr. D. T. Barry, of the Forest Department, Ceylon, is appointed to be an Assistant Conservator of Forests, 2nd grade, with effect from the 18th March 1905, and his services are placed at the disposal of the Government of Madras from that date.

2.—MADRAS GAZETTE.

21st March 1905.—No. 120.—Mr. Francis Cowley Loftus Cowley-Brown, Deputy Conservator of Forests, is, on return from privilege leave and before resuming his duties as District Forest Officer, Bellary, posted temporarily to the Nilgiris for six weeks to make valuation surveys of the *Acacia* and *Eucalyptus* plantations under the orders of the Conservator of Forests, Southern Circle.

No. 121.—Mr. Henry Joshua McLaughlin, Extra Assistant Conservator of Forests, is appointed to act as District Forest Officer, Bellary, during the absence of Mr. Cowley-Brown on other duty or until further orders.

No. 122.—Mr. Stephen Cox to act as Deputy Conservator of Forests, 3rd grade, during the absence of Mr. C. D. P. Thornton on leave.

No. 123.—Mr. Robert Daniel Richmond to act as Deputy Conservator of Forests, 4th grade, *vice* Mr. S. Cox, until the date of Mr. C. E. C. Fischer's return from leave and thereafter to revert to his acting appointment as Assistant Conservator of Forests, 1st grade.

No. 124.—Mr. William Aitchison to act as Deputy Conservator of Forests, 4th grade, *vice* Mr. S. Cox, from the date of Mr. C. E. C. Fischer's return from leave.

25th March 1905.—No. 125.—The following appointments are made :—

(1) Mr. Horace Archibald Gass to act as Conservator of Forests, 1st grade, during the absence of Mr. E. D. M. Hooper on leave.

(2) Mr. Charles Edward Brasier to act as Conservator of Forests, 2nd grade, *vice* No. (1).

(3) Mr. Alfred Wyndham Lushington to act as Conservator of Forests, 3rd grade, *vice* No. (2).

29th March 1905.—*Transfer*.—On the arrival of Deputy Ranger K. K. Ramaswamy Aiyar from the Forest School, Dehra Dun, N. Swaminatha Aiyar, Ranger, Kurnool West, is transferred to Anantapur.

1st April 1905.—*Leave*.—Mr. A. B. Myers, Ranger II, South Coimbatore, is granted privilege leave, under article 260 of the Civil Service Regulations, for twenty-seven days from 1st April 1905.

3rd April 1905. No. 146.—Mr. D. I. Barry, Assistant Conservator of Forests, 2nd grade, who has been transferred recently to the Presidency by the K. R. H. Order, 1904, the Secretary of State for India, is posted to South Ar. 2 to do duty under Mr. J. S. Barrow.

2nd April 1905.—Appointment and Posting. Mr. H. L. K. 3, Head Clerk of the Office of the Registrar of the District, is appointed to be K. R. H. 3, sub. *pro tem.*, and posted to South Madras Division.

7th April 1905. *Provisions.* The following provisions are ordered in the K. R. H. Order of the Secretary of State for India, with effect from 1st November 1904:—

A. H. Simpson, K. R. H. 3, from 6th grade to 5th grade, acting sub. *pro tem.*

J. Subbaraya Aiyar, K. R. H. 3, from 6th grade to 5th grade, acting sub. *pro tem.*

3. — BOMBAY GAZETTE.

1st April 1905.—No. 2.—Mr. E. M. Hodgson, Acting Deputy Conservator of Forests, 3rd grade, delivered over, and Mr. C. G. Laha, Extra Assistant Conservator of Forests, 2nd grade, received charge of, the office of the Sub-Divisional Forest Officer, Surat, on the 16th March 1905, in the forenoon.

2nd April 1905. No. 1757.—Mr. P. E. Archibson, Assistant Conservator of Forests, passed an examination in Kannarese according to the Higher Standard on 11th March 1905.

4th April 1905.—No. 2825.—Mr. A. D. Wilkins, Deputy Conservator of Forests, 2nd grade, and Divisional Forest Officer, Poona, is allowed such privilege leave as may be due to him on 10th June 1905 in combination with furlough for one year.

5th April 1905. No. 46. Mr. Sadashive Pandurang Limaye, Acting Extra Assistant Conservator of Forests 4th grade, delivered over, and Mr. Metharam, Deumal Jagtiani, Extra Assistant Conservator of Forests, 4th grade, received charge of, the office of the Sub-Divisional Forest Officer, Central Thana, on the 20th March 1905, in the forenoon.

7th April 1905.—No. 76. Mr. G. M. Ryan, Deputy Conservator of Forests, acting 2nd grade, delivered over, and Mr. W. F. D. Fisher, Deputy Conservator of Forests, acting 2nd grade, received charge of, the office of Divisional Forest Officer, Central Thana, on the 31st March 1905, in the afternoon.

6th April 1905. No. 100. Mr. G. J. Rege, Personal Assistant to the Conservator of Forests, S. C., who was allowed thirty days' privilege leave from the 5th ultimo, resumed his duties at Belgaum on the forenoon of the 4th April 1905.

25th April 1905. No. 3449. Mr. H. L. Newman, Divisional Forest Officer, W. D. Kanara, is granted privilege leave for three months in combination with special leave on urgent private affairs for three months.

No. 3350. His Excellency the Governor in Council is pleased to make the following appointments:

Mr. Bajjibhai Jadhavbhai Patel, L. C. E., to be Extra Assistant Conservator of Forests, Northern Circle;

Mr. Metharam Deumal Jagtiani, to be Extra Assistant Conservator of Forests, Sind Circle.

4. — BENGAL GAZETTE.

3rd April 1905.—No. 2009 For.—Mr. W. R. LeG. Jacob, Assistant Conservator of Forests, attached to the Buxa Division, is appointed to relieve Mr. J. L. Baker, Officiating Deputy Conservator of Forests, of the charge of the Direction Division and of the duties of Personal Assistant to the Conservator of Forests, Bengal.

15th April 1905.—No. 153 T. R.—Mr. A. H. Mee, Extra Assistant Conservator of Forests, on his return on the 31st March 1905 from deputation to certain Tributary States of Orissa, is appointed to the charge of the Sonthal Parganas Division.

Mr. P. J. Draper, Extra Assistant Conservator of Forests, on being relieved of the charge of the Sonthal Parganas Division by Mr. Mee, is transferred to the Sundarbans Division as an attached officer.

17th April 1905.—No. 169 T. R.—Privilege leave for 14 days, under articles 246 and 260 of the Civil Service Regulations, is granted to Mr. T. H. Monteath, Deputy Conservator of Forests, sub. *pro tem.*, in charge of the Puri Division, with effect from the 25th April 1905 or from such subsequent date as he may avail himself of it.

5.—UNITED PROVINCES GAZETTE.

7th April 1905.—No. 1335—II-198-1905.—Lala Gulab Rai, Extra Assistant Conservator of Forests, in charge of the Saharanpur Forest Division, School Circle, on being relieved, privilege leave for two months and 20 days.

No. 1357—II-266-1905.—Pandit Keshavanand Extra Assistant Conservator of Forests, on completion of his special duty in the Kashipur Court of Wards estate in the Bijnor District, privilege leave combined with furlough for a total period of one year and 34 days.

4th April 1905.—No. 1277—II-198-1905.—Mr. T. Carr, Assistant Conservator of Forests from the Garhwal Forest Division, Central Circle, to the Jaunsar Forest Division, School Circle.

7th April 1905.—No. 1336—II-198-1905.—Mr. E. A. Courthope, Assistant Conservator of Forests, from the Direction Division to the charge of the Saharanpur Forest Division of the School Circle.

8th April 1905.—No. 1374—II-228-1905.—Babu Karuna Nidhan Mukerji, Rai Bahadur, Extra Deputy Conservator of Forests, in charge of the Gonda Forest Division, Oudh Circle, privilege leave for one month and 14 days, with effect from the 25th April 1905, or subsequent date.

8th April 1905.—No. 1375—II-228-1905.—Mr. R. St. G. Burke, Assistant Conservator of Forests, in charge of the Gorakhpur Forest Division, Oudh Circle, to hold charge of the Gonda Forest Division, in addition to his own duties during the absence on leave of Babu Karuna Nidhan Mukerji, Rai Bahadur.

10th April 1905.—No. 1415—II-33-1904.—Mr. P. H. Clutterbuck, Deputy Conservator of Forests, in charge of the Kheri Forest Division, Oudh Circle, to hold charge of the Pilibhit Forest Division in addition to his own duties.

10th April 1905.—No. 1416—II-33-1904.—Mr. E. L. Haslett, Extra Assistant Conservator of Forests, from the Pilibhit Forest Division, to the Kheri Forest Division, Oudh Circle.

No. 1417.—II-33-1904.—Mr. J. Whitehead, Assistant Conservator of Forests, from the Kheri Forest Division to the Pilibhit Forest Division, Oudh Circle.

26th April 1905. No. 1576—II-86A-12.—In partial modification of Notification No. 413—II-86A-12, dated 1st February 1905, the following temporary promotions and reversions are notified for general information :—

Entry No.	With effect from	Consequent on	Name	From	To
1	15th December 1904.	The transfer of a post of Deputy Conservator of Forests, 3rd grade, to the Provincial Service,	Mr. F. F. R. Channer.	Officiating Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 4th grade.
			Mr. E. A. Courthope.	Officiating Deputy Conservator of Forests, 4th grade.	Officiating Assistant Conservator of Forests, 1st grade.
			Mr. F. Canning.	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 2nd grade.
2	15th December 1904.	The return from leave of Mr. H. G. Billson.	Mr. H. G. Billson.	Deputy Conservator of Forests, 4th grade.	Officiating Deputy Conservator of Forests, 3rd grade.
			Mr. R. C. Milward.	Officiating Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 4th grade.
			Mr. E. R. Stevens.	Officiating Deputy Conservator of Forests, 4th grade.	Assistant Conservator of Forests, 1st grade.
			Mr. R. St. G. Burke.	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 2nd grade.

6. FOREST GAZETTE.

3rd March 1905. No. 174.—*Amendment*.—In pursuance the Departmental Order of the 1st July 1904, it is made the following provision consequent on the suspension of Senior Forest Officer Extra Assistant Conservator, 3rd grade in the absence leave with effect from the 1st March 1905.

Senior Forest Officer Extra Assistant Conservator, 3rd grade, subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade in the 3rd grade subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade.

Senior Forest Officer Extra Assistant Conservator, 3rd grade, subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade.

Senior Forest Officer Extra Assistant Conservator, 3rd grade, subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade.

3rd March 1905. No. 175.—*Amendment*.—Senior Forest Officer Extra Assistant Conservator and Junior Forest Officer Extra Assistant Conservator, 3rd grade, subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade.

10th April 1905. No. 223. A.L. 10. 4.—*Amendment*.—Mr. A. J. Gorman, Deputy Conservator of Forests and Senior Forest Officer Extra Assistant Conservator, 3rd grade, subordinate in 3rd grade in the 3rd grade and not yet been in the 3rd grade.

7. FOREST PRINCIPAL GAZETTE.

24th March 1905. No. 174. Privilege leave for two months and eighteen days, under Article 260 and 261 of the Civil Service Regulations, is granted to Mr. R. S. Hume, Deputy Conservator of Forests, with effect from the 1st April 1905, or the subsequent date on which he may avail himself of it.

3rd March 1905. No. 204.—Privilege leave for three months, under Article 260 of the Civil Service Regulations, is granted to Mr. A. E. Lorne, Deputy Conservator of Forests, with effect from the 25th April 1905, or the subsequent date on which he may avail himself of it.

No. 205. Mr. B. N. Aravam, Ordinary Extra Assistant Conservator of Forests, placed in charge of that Division during the absence of Mr. A. E. Lorne, in addition to his duties as Working Plans Officer.

14th April 1905. No. 10.—*Managers*. Krishna Dandekar, Manager, who was appointed on probation as Ranger, 6th grade, by Departmental Order No. 82 dated the 24th July 1903, is hereby confirmed in his present grade.

15th April 1905. No. 11.—*Sub-Manager*, Range, who was appointed on probation as Ranger, 6th grade, by Departmental Order No. 219 dated the 20th March 1904, is hereby confirmed in his present grade with effect from the 1st April 1904.

No. 12.—*Sub-Manager*, Range, who was appointed on probation as Ranger, 6th grade, by Departmental Order No. 217, dated the 24th March 1904, is hereby confirmed in his present grade, with effect from the 2nd March 1904.

This cancels Departmental Order No. 170 of the 2nd January 1905.

15th April 1905. No. 2465.—Mr. A. A. Dunbar-Brander, Assistant Conservator of Forests, in charge of the North Chanda Forest Division, has been granted leave on medical certificate for eight months, with effect from the date on which he may avail himself of it.

14th April 1905. No. 2524.—Privilege leave for forty-two days, under Article 260 of the Civil Service Regulations, is granted to Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, in charge of the Basim Forest Division, with effect from the 17th May 1905, or the subsequent date on which he may avail himself of it.

Mr. S. Srinivasulu Naidu, Extra Assistant Conservator of Forests, is temporarily placed in charge of the Basim Forest Division in addition to the Wun Forest Division during the absence of Mr. Pandurang Narayan.

20th April 1905. No. 2584.—Privilege leave for three months in combination with furlough for sixteen months, under Article 233 in 260 and 308 (b) of the Civil Service Regulations, is granted to Mr. S. L. Kenny, Deputy Conservator of Forests, South Chanda Forest Division, with effect from the 20th May 1905, or the subsequent date on which he may avail himself of it.

No. 2585.—Mr. Gangaprasad Khatri, Extra Assistant Conservator of Forests, is appointed to hold charge of the South Chanda Forest Division, during the absence of Mr. S. L. Kenny on leave, or until further orders.

20th April 1905.—No. 9.—Under Article 31 (1) of the Forest Department Code, 5th edition, Prannath Dar Dakshini, a private student of the Imperial Forest School, Dehra Dun, who has duly obtained the higher standard certificate of the school, is appointed to fill an existing vacancy as Ranger, 6th grade, on probation for six months, with effect from the afternoon of the 15th April 1905, and is posted to the Chhindwara Division.

No. 10.—Under the authority conferred by Article 31, clause (1), of the Forest Department Code, 5th edition, the undermentioned stipendiary students, who were deputed to the Imperial Forest School, Dehra Dun, and who have duly obtained the higher standard certificate of the school, are appointed Rangers, 6th grade, on Rs. 50 per mensem, on probation for six months, with effect from the 1st April 1905, and are posted to the Divisions specified opposite their names :—

- | | | | |
|----------------------------|-----|-----|-----------|
| (1) R. B. Golwelker | ... | ... | Balaghat. |
| (2) Rajant Kanta Chatterji | ... | ... | Bilaspur. |

8.—BURMA GAZETTE.

6th March 1905.—No. 334-F.—Mr. R. McIntosh, Deputy Conservator of Forests, 3rd grade, Madras, is transferred to Burma in the interests of the public service, with effect from the date on which he makes over charge of his duties as Instructor, Imperial Forest School, Dehra Dun.

27th March 1905.—No. 5.—Mr. F. T. Dalton, Forest Ranger, 3rd grade, availed himself of the privilege leave for one month and twenty-five days granted him in Conservator's Office order No. 144, dated the 22nd March 1905, on the afternoon of the 9th March 1905.

23rd March 1905.—No. 7.—Mr. S. Carr, Deputy Conservator of Forests, made over, and Mr. F. Beadon Bryant, Conservator of Forests, received, charge of the Yaw Division on the afternoon of the 13th March 1905.

29th March 1905.—No. 151 (Forests).—Mr. S. Carr, Deputy Conservator of Forests, is transferred from Pakokku and is posted to the charge of the Tharrawaddy Forest Division.

29th March 1905.—No. 152 (Forests).—Mr. H. C. Walker, Officiating Deputy Conservator of Forests, on return from leave, is posted to the charge of the Yaw Forest Division.

31st March 1905. No. 170 (Forests).—Under the provisions of articles 233, 246, 260 and 308 (b) of the Civil Service Regulations, Mr. R. McIntosh, Deputy Conservator of Forests, is granted privilege leave for one month and twenty-six days, and furlough in continuation thereof for six months and four days, with effect from the 1st April 1905.

7th April 1905. No. 8.—With reference to Revenue Department Notification No. 152 (Forests), dated the 29th March 1905, Mr. H. C. Walker, Officiating Deputy Conservator of Forests, took over charge of the Yaw Forest Division on the forenoon of the 5th April 1905, relieving Mr. F. Beadon Bryant, Conservator of Forests.

10th April 1905.—No. 187 (Forests).—Mr. C. B. Smales, Deputy Conservator of Forests, has been permitted by His Majesty's Secretary of State for India to return to duty within the period of his leave.

No. 188 (Forests).—Mr. C. B. Smales, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of extraordinary leave without pay for four days.

11th April 1905.—No. 271 (Forests).—The following alterations in rank are ordered in the Subordinate Forest Service :—

- (1) With effect from the 1st June 1904:
Maung Peik, Ranger, 4th grade, to be Ranger, 3rd grade.

- (2) With effect from the 13th September 1904 :
Maung Byaung, Ranger, 4th grade, to be Ranger, 3rd grade, sub. *pro tem*.
- (3) With effect from the 18th September 1904 :
Maung Byaung, Ranger, 3rd grade, sub. *pro tem*, to be confirmed in that grade.

Maung Po Thin (1), Ranger, 4th grade, to be Ranger, 3rd grade, sub *pro tem*.

- (4) With effect from the 22nd October 1904 :
Maung Po Thin (1), Ranger, 3rd grade, sub. *pro tem*, to be confirmed in that grade.

Maung Po Thet, Ranger, 4th grade, to be Ranger, 3rd grade, sub *pro tem*.
12th April 1905.—No. 6.—With reference to Revenue Department Notification No. 679 (Forests), dated the 7th November 1904, Mr. A. S. Rencontre, Extra Assistant Conservator of Forests, assumed charge of the Mergui Range, South Tenasserim Division, on the afternoon of the 23rd December 1904.

10th April 1905.—No. 3.—With reference to Revenue Department Notification No. 163 (Forests), dated the 29th March 1905, Mr. A. Lawrence, Deputy Conservator of Forests, made over, and Mr. W. F. L. Tottenham, Deputy Conservator of Forests, received charge of, the Katha Forests Division on the afternoon of the 7th April 1905.

14th April 1905.—No. 192 (Forests).—Under the provisions of articles 233, 246, 260, and 308 (b) of the Civil Service Regulations privilege leave for three months and furlough in continuation thereof for seven months is granted to Mr. J. Copeland, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

18th April 1905.—No. 206 (Forests).—On return from duty in the Andaman Islands Mr. F. H. Todd, Deputy Conservator of Forests, is posted to the charge of the Pyinmana Division, *vice* Mr. C. E. Muriel, Deputy Conservator of Forests, transferred.

18th April 1905.—No. 193 (Forests).—Under the provisions of articles 233, 260 and 330 of the Civil Service Regulations, Mr. A. Lawrence, Officiating Deputy Conservator of Forests, is granted privilege leave for two months and twenty-two days and leave on medical certificate in continuation thereof for nine months and eight days, with effect from the date on which he availed himself of the privilege leave.

18th April 1905.—No. 203 (Forests).—Under the provisions of articles 233, 246, 260 and 308 (b) of the Civil Service Regulations privilege leave for three months and furlough in continuation thereof for sixteen months is granted to Mr. G. E. S. Cubitt, Deputy Conservator of Forests, with effect from the date on which he may avail himself of the privilege leave.

18th April 1905.—No. 204 (Forests).—Mr. L. C. Davis, Officiating Deputy Conservator of Forests, is posted to the charge of the Upper Chindwin Division, *vice* Mr. G. E. S. Cubitt, Deputy Conservator of Forests, proceeding on leave.

9.—ASSAM GAZETTE.

24th March 1905.—No. 2369G.—Babu Jnanada Charan Sen, Extra Assistant Conservator of Forests, who was under orders of transfer to the Goalpara Forest Division, was attached temporarily to the Cachar Forest division, on relief by Mr. A. R. Dicks, Deputy Conservator of Forests, from the 28th February to the 4th March 1905.

27th April 1905.—No. 3719G.—Mr. G. M. Townshend, Assistant Conservator of Forests, 2nd grade, is appointed to officiate as Assistant Conservator of Forests, 1st grade, with effect from the 14th November 1904, to fill an existing vacancy in that grade.

10.—MYSORE GAZETTE.

Nil.

TIMBER AND PRODUCE TRADE.

CHURCHILL AND SIM'S WOOD CIRCULAR.

4th April 1905.

EAST INDIA TEAK.—The deliveries for March amount to 1,161 loads, as against 997 loads in March last year, making the deliveries for the first quarter of 1905 up to 3,295 loads against 2,784 loads in the same quarter of 1904. The Teak market in London seems to have realised its position during March, a demand having sprung up from all quarters which can only be very partially met. Sellers have been turning a good deal of old stock into money at improved quotations, and buyers have to put up with what they can get rather than with what they would like. There seems no prospect of any change in this position, shippers having more than they can do to supply urgent contract demands and having nothing to spare for European markets. The moment is a favourable one for Java shippers to show what they can do.

ROSEWOOD.—**EAST INDIA.**—Is in rather better demand, but still sales are small and stock sufficient

SATINWOOD—**EAST INDIA.**—Continues dull of sale and stocks are ample.

EBONY—**EAST INDIA.**—Can only be placed at low rates.

PRICE CURRENT.

Indian teak, log,	per load	...	...	...	£10 to £18 15s.
" " planks	"	...	...	...	£13 to £20 5s.
Rosewood, per ton	...	...	...	...	£5 to £12
Satinwood " sq ft.	...	...	...	...	7d. to 18d.
Ebony " ton	...	...	...	...	£6 to £10

DENNY, MOTT AND DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st April 1905.

TEAK.—The landings in the docks in London during March consisted of 243 loads of logs and 231 loads of planks and scantlings, or a total of 474 loads, as against 516 loads for the corresponding month of last year. The deliveries into consumption were 729 loads of logs and 411 loads of planks and scantlings—together 1,140 loads, as against 897 loads for March 1904.

The dock stocks at date analyse as follows:—

	4,400 loads of logs, as against	6,366 loads at the same date last year.
	3,221 " planks "	4,008 " " "
Total	7,621 loads	10,374 loads

In addition to the above statement the following figures for the quarter in comparison with the first three months of 1904 should be useful:—

	1905.	1904.		1905.	1904.
	Loads.	Loads.		Loads.	Loads.
LANDINGS.—Logs ...	1,265	765	DELIVERIES.—Logs ...	1,946	1,346
Planks ...	964	1,225	Planks ...	1,231	1,129
	<u>2,229</u>	<u>1,990</u>		<u>3,177</u>	<u>2,475</u>

The foregoing figures give ample evidence of the abnormally short supplies of Teak at the Indian shipping ports. The unprecedentedly high prices paid for some months past for fresh imports have failed to result in shipments of any importance; and holders on this side, while obtaining the enhanced prices without much difficulty, see their stocks dwindling with no sound prospects of adequately replenishing them this year. Business, therefore, continues to contract, and there seems little hope of this market opening out until some estimate can be formed as to whether next Autumn's output from the Indian forests will be sufficient to give promise of a renewal at the commencement of next year of the ordinary supplies to Europe.





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